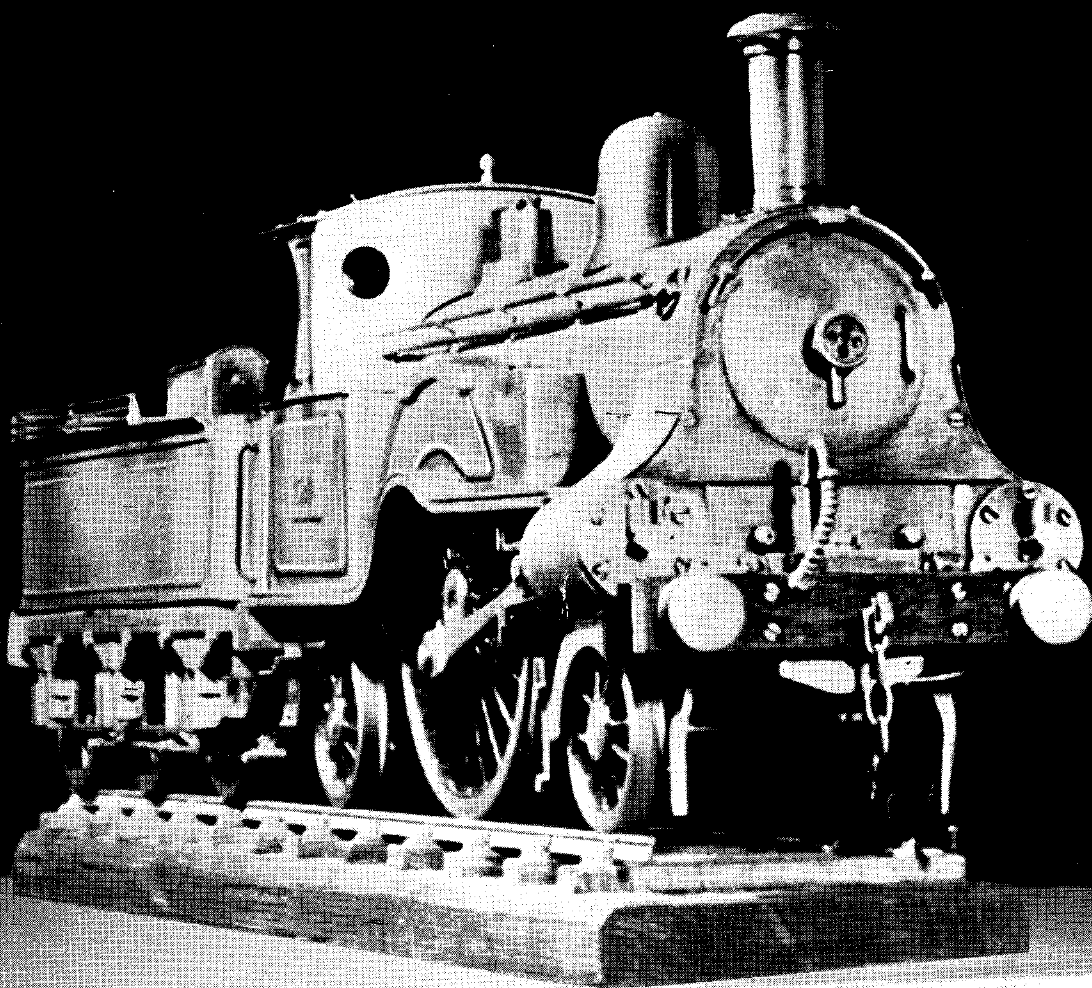
THE MODEL ENGINEER



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The MODEL ENGINEER

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SMOKE RINGS

Hot-air Engines

● THERE HAVE recently been signs of a revival of interest in this form of motive power, which was once popular for many purposes are now catered for by the small i.c. engine or the fractional horse-power electric motor. Although practically obsolete for purely utility purposes nowadays, however, it is none the less attractive to the mechanical enthusiast who is seeking something interesting and unusual to construct. Several articles on hot-air engines have been published in THE MODEL ENGINEER within the last two or three years, but the principles on which these engines work are still a mystery to many of our readers, and numerous queries on this subject have been received. For a comprehensive review of the basic theory and practice of the various types of these engines which have been produced in the past, we cannot do better than refer readers to a series of articles entitled "Practical Notes on Hot-air Engines" by "Artificer" which appeared in THE MODEL ENGINEER from September to December, 1940. Incidentally, it may be remarked that the apparent mechanical simplicity of the hot-air engine has often proved to be deceptive, and many constructors have failed to get such engines to work successfully. The main reason for this is that on account of the very low working pressure obtainable by simple methods of heating air, the importance of good workmanship, including fit and finish, airtightness of pistons and glands, elimination of friction and correct use of materials, assumes a very high importance in the efficient utilisation of this medium; but given sufficient attention to these points, the hot-air engine is a smooth-running, durable and entirely reliable form of motive power which is equally fascinating, both in its construction and subsequent application.

Readers interested in this form of motive power will find the article on a "Spirit-fired Hot-air Engine," which commences in this issue, well worth their careful study.

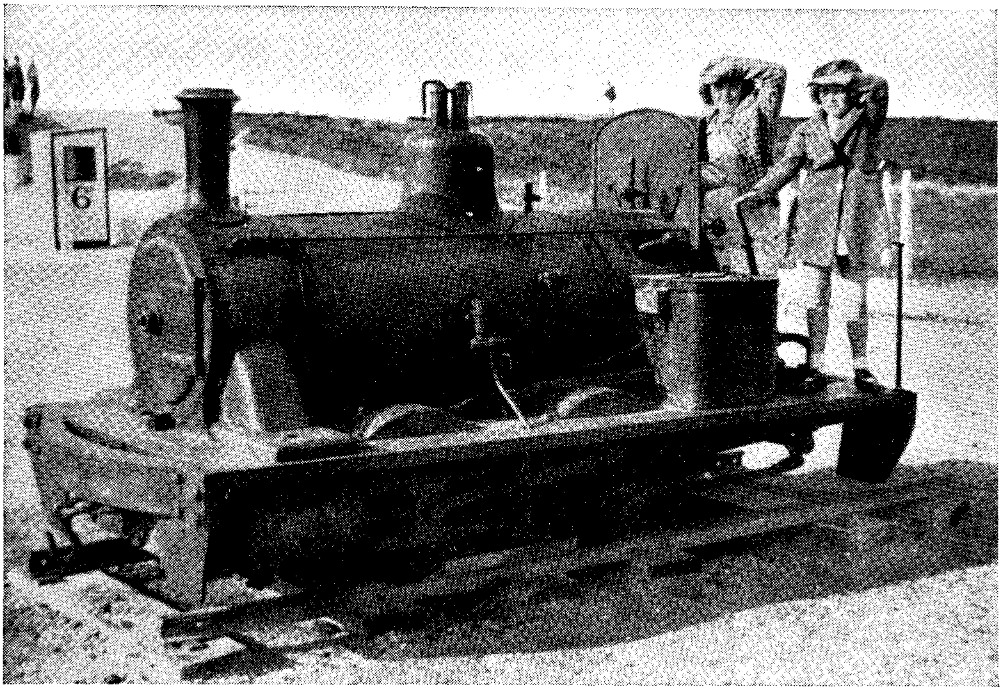
Exhibition Models

● ON OUR visits to provincial exhibitions we constantly come across first-class examples of our craft. In discussing these models with their constructors, we are sometimes amazed at their modesty, and often perturbed at their apparent horror of showing their work in any but their own localities.

Recently, we announced the dates of the 1951 MODEL ENGINEER Exhibition. We hope that all model engineers will keep their eyes and ears open from now onwards, and encourage their friends to enter their models in the loan and competition sections. It is our aim to have on show every worthy exhibit in the country; let us direct our efforts to ensure that they are on the stands in time for the opening date.

What is it?

● FROM TIME to time, readers send us brief descriptions and photographs of miniature locomotives that are not known to us; the photograph reproduced here is a case in point. The print has been sent us by Mr. H. C. Tait, of Walthamstow, who writes :—



"The photograph was taken near Shell Beach, on Canvey Island, Essex, and the engine appears to be of the 'not too little, not too much' type. What is it? It seems a ducky loco to model."

We seem to recollect having, at some time or other, heard of a light railway for Canvey Island; but we have been unable to find any information as to where or when we heard about it. Judging from the photograph, the engine is certainly of robust and simple design, while the gauge of the track seems to be a fairly wide one for so small an engine, possibly as much as 2 ft. 6 in. Of course, it may have been a contractor's engine employed on some constructional work and abandoned when the work was completed. Can any reader give some particulars, or say if our idea of a Canvey Island railway is correct?

Models in Civil Engineering

● THE USES of small scale models in connection with mechanical and marine research are well known; the facility with which the stresses in a machine or structure, or the resistance of a moving body in air or water, can be tested by means of scale models, are widely appreciated. It may not, however, be quite so well known that in civil engineering which deals with projects on the largest conceivable scale, test models have an equally useful range of application, and may often be the means of saving a considerable amount of expense. In a recent issue of a journal devoted to civil engineering, reference was made to methods of testing the strength of dams, sea walls, bridge piers and similar structures, also their liability to failure in conditions of overstress, by means of simple models. The same principle can obviously be extended to testing the strength of embanked railway tracks or cuttings, the risk of displacement under extreme climatic conditions, including earthquakes, landslides or violent storms. There is, in fact, no field of engineering in which models may not, with advantage, play their part, either in research, demonstration or planning; and full-scale model engineers are coming to realise more and more the moral of the old fable about the lion who was assisted by the mouse.

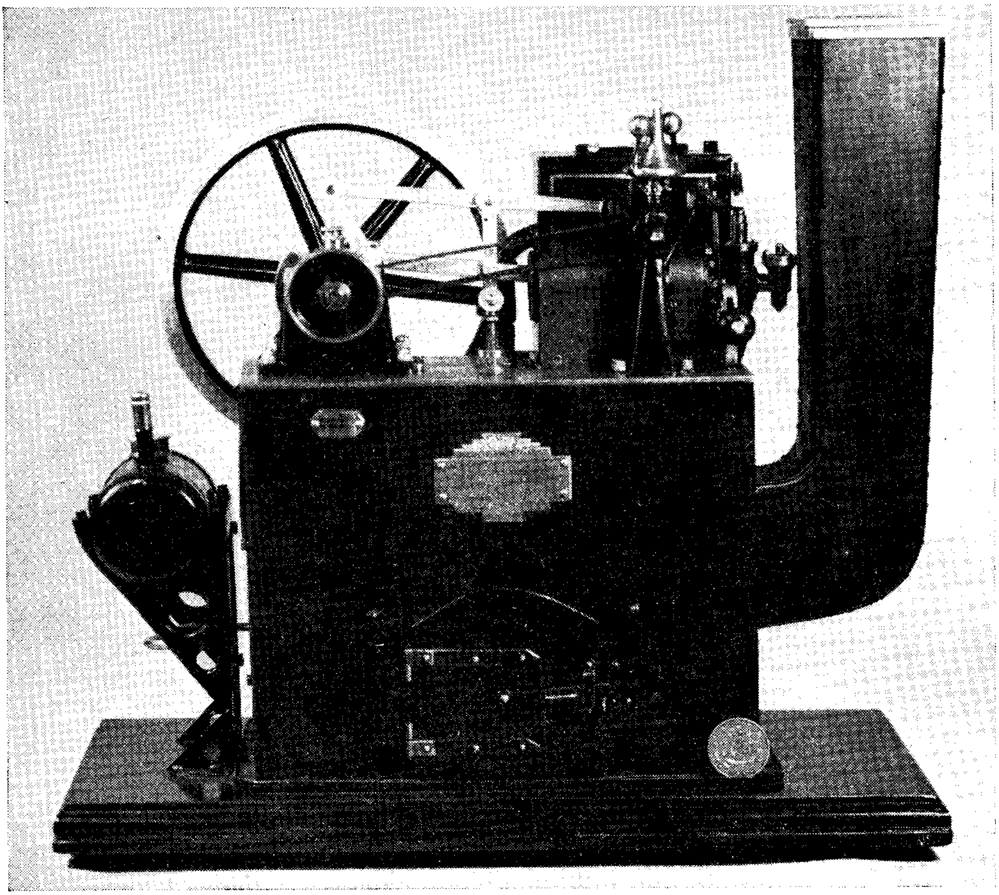
Honour for a Winner

● WE LEARN that Mr. C. G. East, whose fine ½-in. scale L.M.S. 4-6-2 locomotive, *The Princess Royal*, was awarded a bronze medal at last year's "M.E." Exhibition, has won further recognition by having this engine selected for exhibition in the Transport section aboard the *Campania*, the Festival of Britian ship. The installation of the engine on board is being supervised by Mr. East who will have the satisfaction of knowing that his handiwork will accompany *Campania* on her cruise round the coast throughout the run of the Festival, calling at all the major ports of Great Britain and Northern Ireland.

A SPIRIT-FIRED HOT-AIR ENGINE

by Mark Wyer

THE development and construction of the hot air engine has very much appealed to me in my later years. I have been modelling for many years in steam, gas, and petrol, but few of my models have pleased me as much as this silent, safe and clean prime mover. I feel that I can make a contribution to the advancement of model engineering by commending this form of engine to our younger engineers. There is a large field of enterprise for the experimentally minded to obtain the utmost efficiency from the least amount of heat with these engines, which are ready in a few moments, and are quite capable of driving small models.



The Engine

The baseplate of the engine was of mild-steel 3/32 in. thick, and its dimensions were $8\frac{1}{8}$ in. × $5\frac{1}{4}$ in., with a section $4\frac{5}{8}$ in × $1\frac{1}{4}$ in. removed to give the flywheel clearance. Four pieces of $1\frac{1}{4}$ in. angle brass were riveted on the underside as fittings for the main casing, or heat chamber, with a clearance of 3/32 in. from the edge.

A piece of heavy-gauge steel tube, $2\frac{3}{4}$ in. × $1\frac{1}{8}$ in. external diameter, comprised the power cylinder. The finished bore was $\frac{15}{16}$ in., and the cylinder was supported at each end by angle shaped pieces of $\frac{1}{8}$-in. steel, bored to fit over the outer diameter. The rear support was silver-soldered, the front being left free at $\frac{1}{16}$ in. from the open end. Silver-solder was also used for the bearing support for the beam lever, the lubricator boss, the oil way and oil pipe, before reaming, and lapping out the bore of the cylinder.

The cylinder casing was of light sheet iron, bent

into a " U " shape with openings neatly cut for reception of the bearing support and lubricator boss. It was held in position on two pieces of angle iron, between supports secured with small screws.

Hard brass was used for the piston, which was $1\frac{1}{8}$ in. long, and needed to be as light as possible. Six equally spaced oil grooves were turned on the diameter, and the gudgeon pin ($\frac{3}{16}$ in. diameter) was fixed in a steel bearing, secured and centrally held by a countersunk nut. This method of constructing a light piston I have found to be the best, as it can be held in the mandrel through the large central hole for lapping and suchlike operations. It is essential that the piston should be a close fit in the bore, moving freely and without leakage.

The long connecting-rod was of hard duralumin (as was its shorter counterpart). It is 7 3/32 in. long and 9/32 in. in section, and 7-B.A. bolts were used to hold cap in position. A built-up crankshaft, $4\frac{3}{4}$ in. long was made and silver-soldered ; the shaft and crankpin being of $\frac{1}{4}$ in. diameter silver-steel rod. Mild-steel was the material used for the webs (7/32 in. thick), which were shaped to form balance weights. The distance between the webs was 0.550 in. to accommodate the connecting-rods.

The shorter connecting-rod was made a forked rod, the end caps being held by 10-B.A. nuts and bolts, with a countersunk head fulcrum pin. Also of hard duralumin was the beam lever, which is $4\frac{5}{8}$ in. centres. At 2 in. centre distance from the cylinder head was located the fulcrum pin for the links that actuated the displacement piston. These links were of the same material as the connecting rods, at a centre distance of $\frac{11}{16}$ in., and were relieved on the inner sides to give adequate clearance to the main connecting rod. All fulcrum pins were of $\frac{3}{16}$ in. diameter, being shouldered and screwed into one link, and a push fit in the other.

The flywheel was a light aluminium casting, 6 in. diameter, width on face $\frac{3}{4}$ in., with six spokes, and was secured with hard steel set-screws. Cast-iron was the material of the pulley, which was $1\frac{1}{8}$ in. in diameter and $\frac{5}{8}$ in. wide, with provision for either a flat or a round belt. The pulley was lightened by drilling six $\frac{3}{8}$ in. diameter holes.

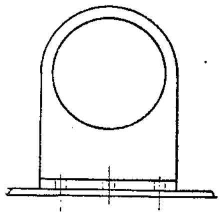
Recesses machined in duralumin pillars 7/32 in. thick held ball-bearings of standard size ($\frac{1}{4}$ in. bore $\times$ $\frac{3}{4}$ in. diameter). The centre distance from the baseplate was $1\frac{3}{8}$ in., and the top caps were secured with 6-B.A. studs and nuts.

A brass piston was used for the control-valve of $\frac{3}{8}$ in. diameter and $\frac{5}{8}$ in. long, with a domed bottom end, which was fitted with a $1\frac{5}{8}$ in. long 7-B.A. rod., to receive at the top two locknuts. The spring which returns the piston to full open position was $\frac{1}{4}$ in. in outer diameter, and was made from wire of diameter 0.020 in. The guide for the rod was $\frac{7}{16}$ in. long ; an accurate fit was essential, so as to avoid leakages.

The Regenerator Cylinder

Steel tube was made use of for the regenerator cylinder, whose dimensions were $2\frac{1}{2}$ in. outer, 2.4 in. inner diameters $\times$ 4 in. long. The outer diameter was reduced towards the lower end to give a wall thickness of 0.035 in., and $1\frac{1}{4}$ in. from the thinner end was parted off to receive the joint that enabled the piston to be fitted. The bottom portion is separate, and can be removed to enable piston to be fitted before bolting up flange.

The joint consisted of two light flanges bolted together by twelve 7-B.A. bolts and nuts equally spaced. Interposed in the joint was a thin aluminium washer, treated with graphite jointing mixture, with its outer ends turned down to form a heat deflection. Closing the end of the short length was a concave disc (0.040 in. thick) silver-soldered in.



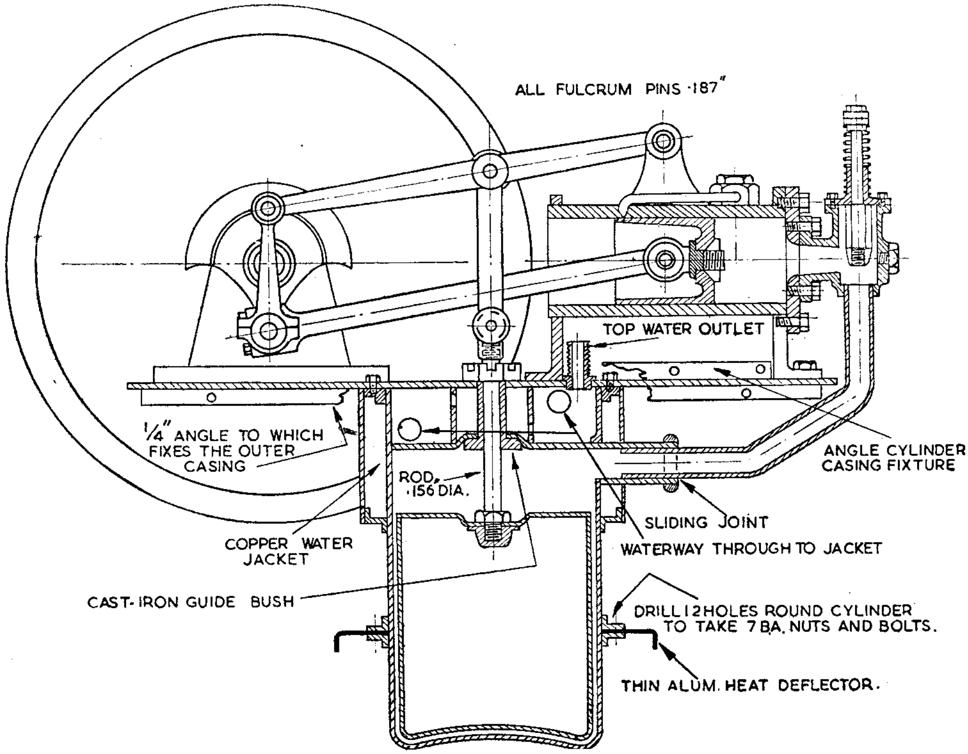
Cylinder supports (2 off). One brazed on to rear end of cylinder, the other left free

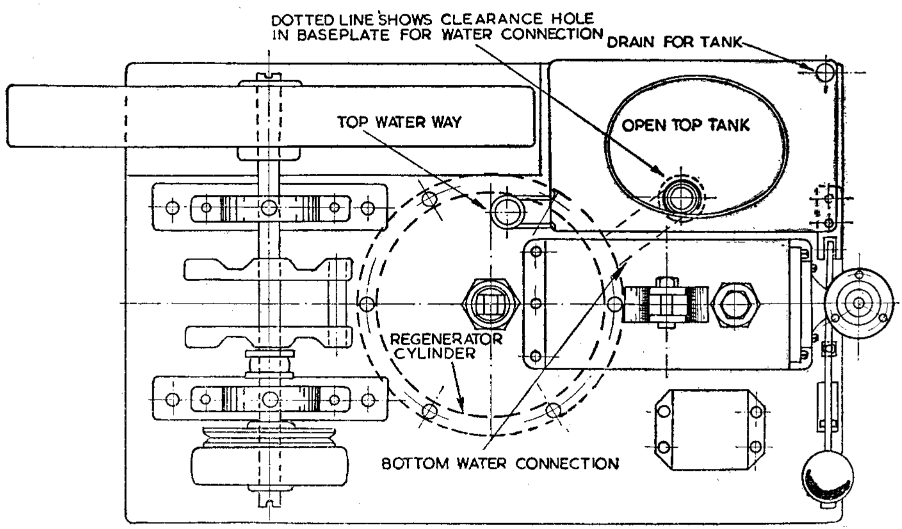
The flange at the upper end of the cylinder was $3\frac{3}{16}$ in. in diameter, and bored to a suitable diameter to receive a 3-in. copper tube which formed a water jacket. This flange was also drilled and tapped to hold six 6-B.A. screws, which were for fixing the cylinder and its contents to the baseplate, this thus forming the top of the water jacket. A second flange was fitted at $1\frac{1}{4}$ in. from the top edge to carry the lower end of the copper tube, and at $\frac{5}{8}$ in. from this edge a disc of steel 3/32 in. thick, suitably shaped to fit the head of the cast-iron guide, was silver-soldered inside the cylinder. To locate this during soldering, a split ring pressed inside was used. This disc formed the head of the heat chamber, and the base of the water jacket.

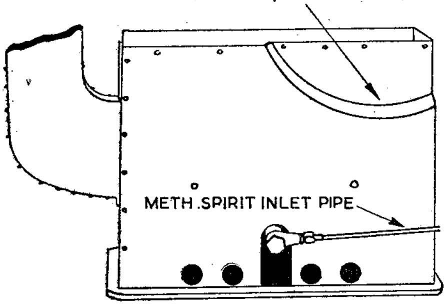
At the highest point below the disc was fitted the outlet gland, which was 1 in. long, and provided a long joint for a copper tube $\frac{3}{8}$ in. in diameter, connecting the heat chamber to the power cylinder. This joint, as with all the joints except the soft-soldered copper ones, was silver-soldered. Above the disc the cylinder was drilled at opposite ends with $\frac{7}{16}$ in. diameter holes, at the highest and lowest points, through which the water flowed from the adjacent jacket.

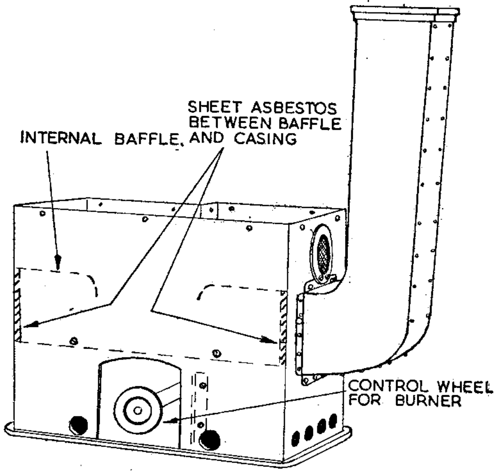
A distance-piece, drilled with holes to allow water flow, separated the baseplate and the water jacket, and was intended to take the load when tightening up the cast-iron guide. At the lowest point of the copper jacket, a screwed brass elbow ($\frac{3}{8}$ in., 26 t.p.i.) was fitted, and an extension of this was carried through a clearance hole in the baseplate to support the water tank, acting also as the lower water connection. The upper waterway was a screwed brass sleeve, shaped at one end to fit a rubber sleeve joint to the tank, and was screwed into the baseplate, immediately in front of the power cylinder, by $\frac{1}{2}$-in. diameter, 32-t.p.i. The guide bush for the piston described below is of cast-iron 1 in. long $\times$ $\frac{1}{2}$ in. diameter, with a screw thread of 32-t.p.i.

A light steel tube formed the displacer piston, the dimensions of which were as follows : outside diameter, 2.250 in., wall thickness 0.020 in., length 2.625 in., the thickness of the bottom concave end was 0.031 in., that of the top end


ALL FULCRUM PINS ·187"
TOP WATER OUTLET
1/4" ANGLE TO WHICH FIXES THE OUTER CASING
ANGLE CYLINDER CASING FIXTURE
ROD, ·156 DIA.
SLIDING JOINT
COPPER WATER JACKET
WATERWAY THROUGH TO JACKET
CAST-IRON GUIDE BUSH
DRILL 12 HOLES ROUND CYLINDER TO TAKE 7 BA. NUTS AND BOLTS.
THIN ALUM. HEAT DEFLECTOR.

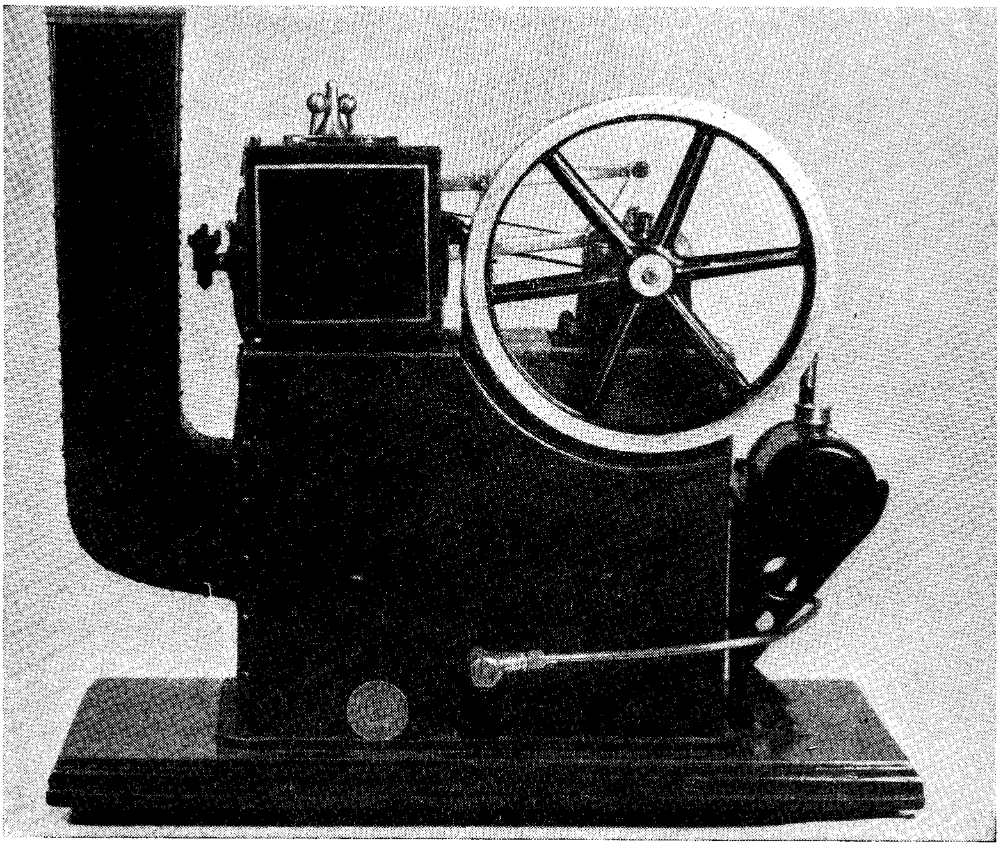

DOTTED LINE SHOWS CLEARANCE HOLE IN BASEPLATE FOR WATER CONNECTION
DRAIN FOR TANK
TOP WATER WAY
OPEN TOP TANK
REGENERATOR CYLINDER
BOTTOM WATER CONNECTION





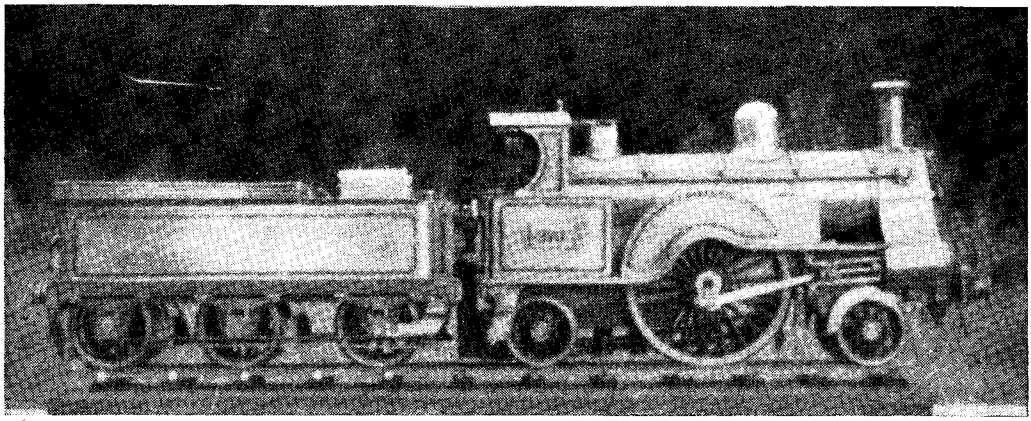
disc being 0.046 in. This latter disc was shaped at the centre to provide clearance for the locknut on the piston-rod. The flanged dome was screwed to take the rod, and the whole was silver-soldered to form a cylinder that would be perfectly air tight under heat. The aforementioned piston-rod was of stainless steel, 0.156 in. in diameter, $2\frac{3}{16}$ in. long, and screwed at both ends, the top end being fitted with a yoke, $\frac{1}{4}$ in. wide at contact faces for the links containing $\frac{3}{16}$-in. holes for fulcrum pins.

(To be continued)



A $2\frac{1}{2}$-in. Gauge L.N.W.R. Single-Wheeler

by E. E. Hobson



THE two photographs, one of which is reproduced on the cover of this issue and the other on this page, show a $2\frac{1}{2}$-in. gauge, L.N.W.R. "Lady of the Lake" class locomotive, recently completed by myself, and was inspired by Mr. F. C. Hambleton's fine drawing of this class in the issue of THE MODEL ENGINEER dated June 6th, 1946.

No drawings and dimensions were available to me other than those accompanying the article, neither were cylinder and driving wheel castings obtainable, and I had to make do with a pair of cylinder castings originally intended for a $2\frac{1}{2}$-in. gauge coal-fired locomotive. A good deal of whittling down was necessary before I got them to something like the required size, and I was lucky in the fact that the core holes were small enough to enable me to bore them out to the $\frac{1}{2}$ in. diameter required.

No commercial castings of any sort could be utilised for the driving-wheels, as each contains 22 spokes for a diameter of $3\frac{7}{8}$ in. Recourse was made to the local foundry who cast for me two cast-iron discs measuring 5 in. diameter by $\frac{5}{8}$ in. thick. I machined these to within $\frac{1}{16}$ in. of finished dimensions and then left them outside for three weeks to season before finishing to size and cutting spokes. Altogether, I put in fifty-six hours on the pair.

The boiler is spirit-fired, and the engine is fitted with full Stephenson's link-motion, boiler feed-pump, and the usual water- and pressure-gauges, blower-valve, etc. Lubrication is by displacement, the lubricator being positioned just behind the buffer beam; it can just be discerned in the picture.

My reason for making a spirit-fired locomotive was the desire to possess one which could be put into operation quickly and easily, for very short periods if necessary, on the garden railway of a very good-hearted friend who grants me "running powers" over his line, and loans me a train of five or six bogie coaches into the bargain. One can put in a very enjoyable ten minutes or so, without having to don overalls or otherwise alter one's appearance, when, for business reasons, it is undesirable to do so.

As I mentioned before, the cylinders are bored to $\frac{1}{2}$ in., and the stroke is exactly 1 in. Working pressure is supposed to be 90 lb. p.s.i., but when hauling the afore-mentioned train and with boiler pump working, the lamp is not hot enough to maintain more than 50 lb. p.s.i. She (her name is *Daffodil*) works very well at this, however, and is most pleasing to watch and to listen to, particularly when starting the train, as she sometimes suffers from momentary, but recurring, wheel spin.

Petroleum Publicity Posters

Our attention has been drawn by the Petroleum Information Bureau, of 29, New Bond Street, W.1, to a new series of coloured pictures which should be of great interest from the aspect of industrial and technical education. The complete set consists of fifteen picture panels, each 20 in. × 16 in. requiring a total wall space of 20 ft., depicting some of the varied activities involved in the discovery of crude oil, its production, refining and distribution. The pictures have been prepared by a leading designer and are very attractive in both colouring and design. Sets are available on loan to exhibitors entirely free of charge for limited periods. Application for the pictures, or any other publicity matter in connection with the production of petroleum and its by-products, should be addressed to the above bureau.

FILING IN THE LATHE

by "NED"

The inexperienced lathe operator, when faced with the difficulty of producing an accurate fit, or a smooth finish, by the use of the normal cutting tools, is often tempted to apply a file to the work while it is running in the lathe, as a simple and readily controllable means of removing tool marks, or the last thousandth of an inch or so of diameter. Many controversies have raged as to whether this practice is permissible in good engineering, and many machinists would feel highly insulted if it were suggested that they ever resorted to such measures ; but let us be strictly truthful and admit that few of us, even the most expert, can say that we *never* use a file in this way. Therefore, before condemning the practice out of hand, let us examine carefully the reasons why it is adopted, and its effects on the general quality of the work.

The ubiquitous hand file is one of the most useful and versatile tools which has ever been put into the hands of engineers, and there are many craftsmen, especially those of the old school, who rely upon it almost entirely for the shaping and fitting of components, whether their surfaces are flat, curved or even completely circular. Running shafts have in many cases been fitted to quite a high degree of precision by filing, and in course of repair work, many millwrights and marine engineers have to use files to correct parallel or circular errors in worn journals, in the absence of any available means of machining them. Model engineers have often produced excellent work without a lathe, by the use of files on work held in a drill brace or on a polishing spindle.

At the same time, not even the most expert user of files will deny that they have very definite limitations. In the manufacture of engineering products, the use of files is nowadays almost entirely superseded, except as a means of removing burrs or superficial roughness of unmachined surfaces ; it has, in fact, been relegated to fettling rather than fitting. As a means of removing metal, files are slow and inefficient compared with machine tools ; for producing a high finish, they are much inferior to abrasive polishing machines ; and where high accuracy is required, their control depends entirely upon the manual skill of the operator, which is a costly and even at times unattainable commodity in the modern factory.

It follows, therefore, that if one has machine tools available for carrying out necessary operations on work pieces, files can and should be dispensed with, except for dealing with minor or unimportant surfaces, where the trouble of setting up for machining would be out of all proportion to the value of the results obtained. Machine tools are, or should be, capable of working to positive geometrical and dimensional accuracy, and of producing a sufficiently high surface finish for all practical purposes.

Sometimes, however, the desired result cannot be obtained directly from the cutting tool of the machine, for some reason or another, and a certain amount of finish fitting with hand tools may be desirable or even necessary. In many

Chamfering is often done with the file, but better results are usually obtainable by the use of a hand-turning tool

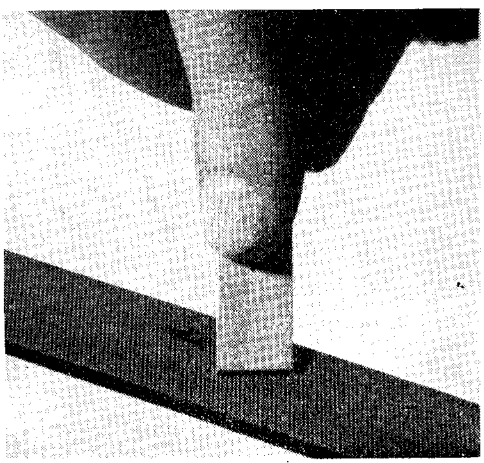
kinds of turned work, especially in the case of shafts which have to be made a close running fit in their bearings, or an interference fit in the bore of a wheel boss, it may be found difficult to adjust the final cut to a sufficiently high degree of accuracy to produce the fit required. Possibly a shaft which must be dead parallel is found to be very slightly tapered, and no means are available for correcting the alignment of the lathe centres ; but even if there is, the critical adjustment necessary may call for a good deal of trial and error. On the other hand, it may be desirable to produce a slight degree of taper on a parallel shaft, such as when making a mandrel for mounting work from a bored centre.

In all such cases, the discreet use of a smooth file on the work is permissible, but on no account should more metal than is absolutely necessary be left for removal by this means. The file should be kept moving over the length of work surface to be operated upon, so as to eliminate the risk or scoring, or uneven local action, and also in the direction of its own length, making deliberate, steady strokes as if using the file in the normal manner on stationary work. If an excessive amount of metal is left for filing, it is by no means certain that the finished surface will be circular or concentrically true, but the error likely to occur in removing one or two thousandths of an inch is hardly perceptible.

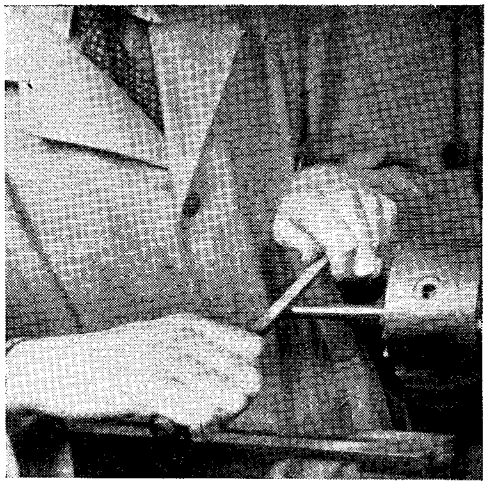
The speed of work for filing in the lathe may be just about the same as for normal cutting operations with carbon steel tools. When filing cast-iron, excessive speed must be avoided, as it is liable to glaze the teeth of the file and destroy its cutting efficiency in a few seconds.

Improving Tool Finish

Some workers find it difficult to produce a high finish on shafts direct from the tool, and resort to the use of a file for removing tool marks, prior to polishing with one or more grades of emery cloth. Before accepting this procedure as inevitable, however, one should investigate the



Cleaning the teeth of a file with a strip of soft metal



Draw-filing a staionary shaft in the lathe to remove tool-marks

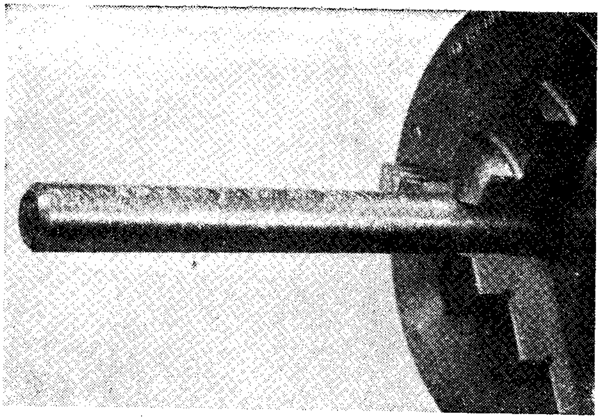
reasons for the poor tool finish, and correct them as far as possible.

The most common cause of this is the use of blunt, or incorrectly ground and set, tools. In the case of a shaft which has been roughed down by fairly heavy cuts, it often happens that the edge of the tool has been dulled, not enough to impair its general cutting efficiency, but sufficient to make it unsuitable for use as a finishing tool. Sometimes a touch up with a small oilstone slip will restore the keen edge, but it is often found better to change the tool for one specially kept for finishing. On steel shafts, a tool with plenty of top rake and the minimum front clearance usually produces the best finish ; the edge should be broad, and have a slight radius if the nature of the work permits. If the cut has to be taken right up to a shoulder, with a sharp internal corner, a side tool having a square "land" at the tip may be used.

Another cause of poor finish is incorrect adjustment of the lathe slides. If the saddle has side play on the bed, the traverse may be uneven, and the tool may alternately move in and out to a slight extent, producing waves, or alternate bands of smooth and rough finish. But the same effect may be caused by over-tight adjustment of the saddle slides, and yet another cause is an eccentric leadscrew, which tends to push the saddle in and out in the course of its rotation. The use of self-acting feed, with correctly-meshed gears and smoothly-working shafts, will usually produce a better finish than hand feed.

Assuming that everything possible has been done to produce a good tool finish, however, it may still not be quite good enough for a running journal, or to look bright enough in the visible parts of a finished model. This may be improved upon by the use of a superfine "Swiss" file, followed by abrasive strips or buff sticks. The finish which can be produced in this way is above criticism in respect of appearance, and

may satisfy some requirements in running journals, but it is not recommended as a finish for the shafts of high-speed steam or i.c. engines. Lapping with a ring lap, or the use of a fine grade oilstone slip, will produce a finish which is nothing like so pretty to look at, but much better adapted to resist wear and friction.



" Criss-cross " grain produced by rapid endwise traverse of the file along the work

Scoring and Pinning

All files are to some extent liable to produce scores, due to particles of metal becoming embedded between the teeth. This is very prevalent when filing steel, or the softer ductile metals, and must be very carefully guarded against, as it may completely mar a surface which is required to be very highly finished. The teeth of the file should be kept clean, not by using a file-card but by running the edge of a copper or aluminium strip along the line of the teeth. Some workers recommend lubricating the file with oil when using it in the lathe, to prevent the adherence of metal, but this very much reduces its cutting efficiency and makes it difficult to " feel " the cut. A better method is to chalk the file ; ordinary blackboard chalk is better than nothing, but block talc (tailors' chalk) has much better lubricating properties. In all cases, the teeth of superfime files will fill up quickly, and must be cleaned before they have time to start " pinning up."

When the length of surface permits, it is advisable to use a broad-faced file, and for long shaft surfaces, quite a rapid traverse of the file in relation to running speed is desirable, so as to produce a " criss-cross " grain pattern, rather than a series of circular scratches. There is, indeed, something to be said for using " draw-filing " methods on slowly rotating or even stationary work, as an effective way of removing tool marks and waves in the surface. It is sometimes asserted that a draw-filed journal works better in a bearing than a dead smooth one, as the longitudinal scratches form minute oil-ways, which help to " key " and distribute the oil film.

Files are often used for chamfering and removing corner burrs from work, but hand gravers or scrapers produce much better results on this class of work in most cases.

Using a Filing Rest

An aspect of the subject which is well worth consideration is the use of a " filing rest " to produce flats on the work, which, in conjunction with a simple method of indexing the mandrel, is extremely useful for producing square, hexagonal or other polygonal work. A simple filing rest with micrometer height adjustment was described by the writer some years ago, and may also be found in the " M.E." handbook *Lathe Accessories*.

Filing Attitude

One difficulty in using a file in the lathe is that the headstock and driving gear are liable to get in the way, and prevent the operator taking up the correct " stance " for efficient filing and proper control of the file. This is least serious in the case of treadle of " underhead " drive, but belt drive from an overhead countershaft may make filing awkward, or even dangerous if the belt is not guarded. It is, in such cases, necessary to keep the left elbow higher than is desirable for comfort—unless one is lucky enough to be left-handed !

Don't get Caught Up !

Great care is necessary to avoid the risk of sleeves or other parts of the clothing getting caught in the chuck or driving gear when using a file on rotating work. In the case of the small lathes used by readers of the " M.E.," the power applied is not usually sufficient to cause serious damage if one gets caught up in the works, though even scratches or torn clothes are things to avoid if possible. But on a powerful lathe, such an accident may result in serious personal injury. On one occasion within the writer's experience, an apprentice was filing a large shaft between centres, when the sleeve of his overall caught in the carrier and he was dragged violently across the lathe bed. If there had not been someone at hand to stop the lathe promptly, it is probable that his injuries would have been much more serious, but as it was, he escaped with a broken forearm. Incidentally, it may be put on record that he was using a 14 in. flat rough file at the time !

Taking it by and large, then, it may be said that all of us (except those who wear stainless steel halos !) indulge in filing in the lathe occasionally, though we may be somewhat reluctant to admit it, and certainly would not commend it as a counsel of perfection. Only the pedants would refuse to admit that it is definitely useful and at times almost indispensable, but it must be used with due discretion and not on any account be regarded as a substitute for care and skill in machine tool operations. As Shakespeare might have said had he been an engineer : " The end may justify the means, my friend ; but let the *means* be worthy of the end " !

IN THE WORKSHOP

by "Duplex"

No. 83—A Motor Drive for the $3\frac{1}{2}$-in. Drummond Lathe

ALTHOUGH the $3\frac{1}{2}$-in. Drummond lathe is now manufactured by Messrs. Myford and is equipped by them with a self-contained motor drive, there are, no doubt, many users of the older model who would welcome some inexpensive form of motor drive for the bench-type machine.

When building this unit to drive a small lathe, more than 30 years ago, it had to be made reasonably compact so as to be accommodated on the bench top; moreover, apart from the $\frac{1}{4}$-h.p. electric motor, the whole unit was assembled from odds and ends, together with some parts from the scrap box. To adjust the belt tension, the countershaft is mounted in a swinging cradle which is readily controlled for belt changing when the operator is either standing or sitting at the front of the lathe. Lubrication presents no difficulties, as the countershaft runs in Skefko self-aligning ball-bearings packed with grease. It will be seen that an ammeter, wired in series with the supply mains, is fitted to the baseboard; this is particularly useful when a new lathe is being run-in, as it will at once indicate by a rise of current any failure of lubrication in the mandrel bearings. Again, the experimental model of the small hacksaw machine, recently described in these pages, was belted to this countershaft and the ammeter used to determine the size of the driving motor required.

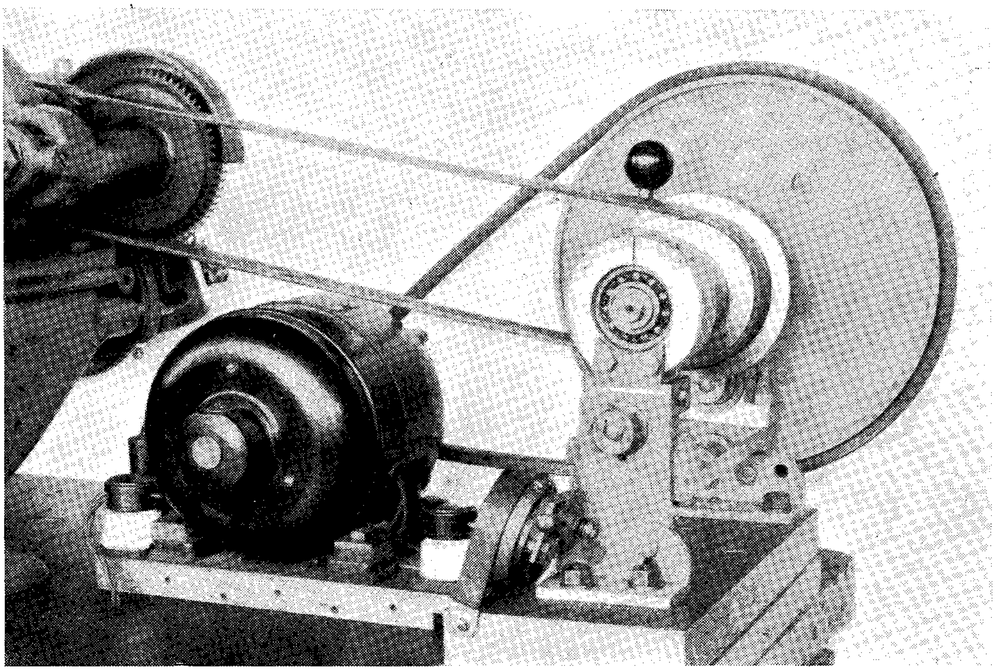


Fig. 1. The complete lathe drive

As the lathe motor is supplied with d.c. electricity from a mains rectifier, a moving-coil ammeter is fitted and a 2-m.f. condenser is wired across the supply circuit to act as an interference suppressor. Although this driving unit has been in use for so many years, it has never given any trouble or required alteration. The centre distance between the countershaft and the lathe mandrel was set at 18 in., and this gives an efficient drive with a 1-in. flat belt run at quite moderate tension; if, instead, a V-belt is used for this portion of the drive, the centre distance can be appreciably shortened to make the unit even more compact.

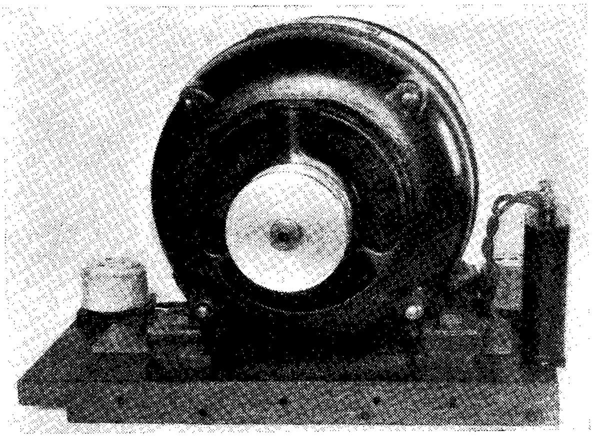


Fig. 2. The motor unit

The overall height of the motor, when mounted on its base, should be kept as low as possible in order to clear the lower run of the flat belt. The size of the base will depend, in part, on the dimensions of the motor foot, but it must be made long enough to allow for a sliding movement of an inch or so when adjusting the tension of the

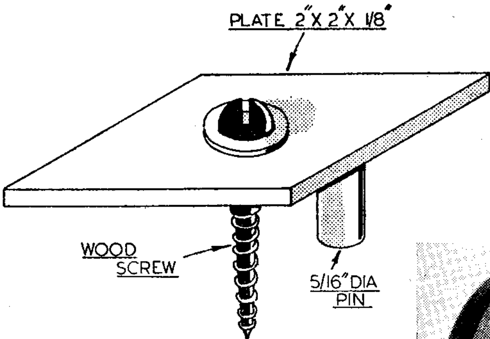


Fig. 3. Plate for clamping the motor baseboard to the bench

motor belt. The quiet running of the motor can be enhanced by fitting felt pads both above and below the four feet, and at the same time the base is isolated from contact with the holding-down bolts by pieces of thick-walled rubber tubing threaded on to the bolt shanks. These bolts should be tightened only just enough to hold the motor in place, for over-compression of the felt pads will destroy their resiliency.

A slot is cut at either end of the oak base to allow for sliding and the clamp plates which secure the base to the bench are held down with round-headed wood screws.

The motor V-pulley is machined from cast-iron, and it will then resist wear better and will keep its correct shape longer than one made of soft alloy. The size of the pulley to give the required drive ratio will depend on the diameter of the countershaft belt pulley, but to increase the efficiency of the drive the motor pulley should be made as large as possible ; in addition, the V-groove should be machined to exactly the angle specified by the belt manufacturer. Where a $\frac{1}{4}$-h.p. electric motor is used, a $\frac{3}{8}$-in. V-belt will serve for the first stage of the drive, and the ratio of the pulley diameters should be about 4 : 1 so that the countershaft will run at some 360 r.p.m.

The Countershaft Unit

Again, the base is made of oak or other hard wood and it must be high enough to ensure that the driving belt, when in any position of the cone pulleys,

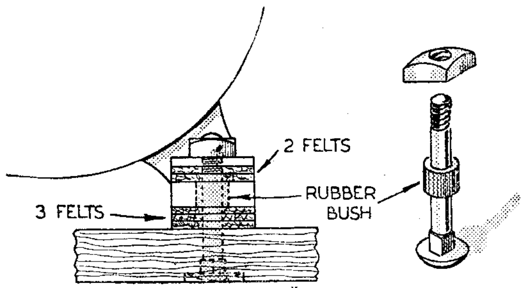


Fig. 4. Resilient form of motor mountings

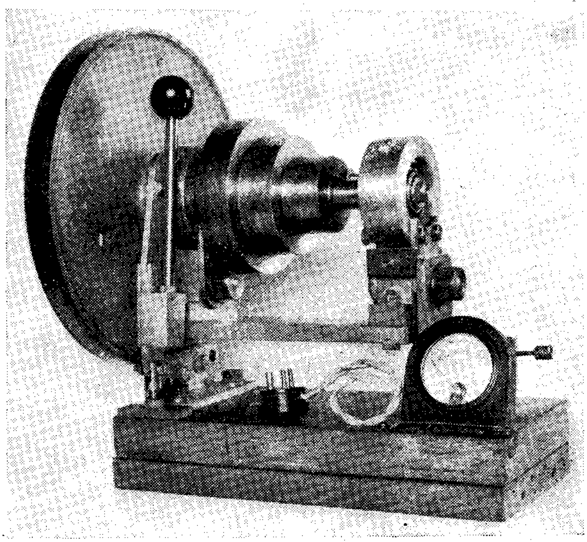


Fig. 5. The countershaft unit

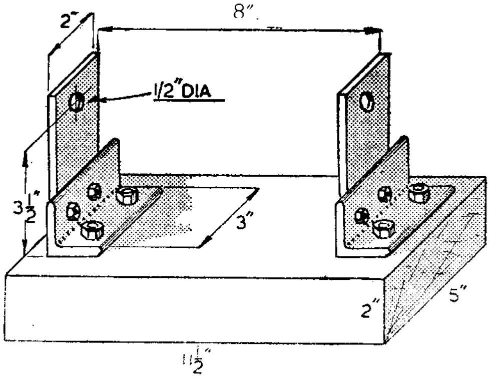


Fig. 6. The wooden base with its two brackets

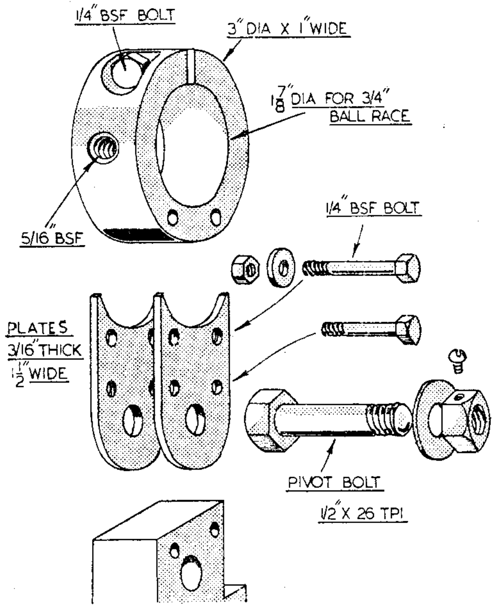


Fig. 8. The two ball-bearing housings and hangers

does not foul either the lathe back gear shaft or the motor itself. To the wooden base, 2 in. in thickness, are bolted the two brackets on which the cradle, carrying the countershaft bearings, pivots.

These brackets consist of a base portion made of angle-iron bolted to a vertical member drilled to form the pivot bearing. Each ½-in. diameter pivot bolt carries a hexagon nut, furnished with a set-screw for locking the adjustment after the cradle has been set to swing freely.

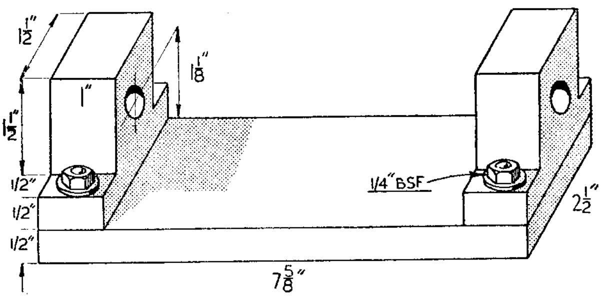


Fig. 7. The cradle base plate and brackets

The cradle is also of built-up construction and consists of a steel bedplate carrying two brackets, bolted in place, for the attachment of the bearing hangers. The bearing housings for mounting the self-aligning ball-bearings are aluminium alloy castings; these were made from portions of a discarded motor-car gearbox and were cast in solid form in a cigarette tin to serve as a mould. The castings were then machined all over and bored to afford a close sliding fit for the bearings; next, one side was slit radially and fitted with a pinch-bolt. The bearing housing next to the driving pulley is closed by means of its bolt so that the bearing is secured in place but without being distorted; the other bearing is clamped less firmly to allow it to align itself by sliding in the housing. The two bearing housings are then bolted to their double hangers and these, in turn, are bolted to the cradle brackets. In this way, a rigid cradle is constructed that can swing on the two pivot bolts which pass through the bearing hangers as well as the cradle brackets and the vertical members attached to the wooden base.

(To be continued)

STEAM TURBINES

Mr. W. H. Rider writes :—" I cannot let this opportunity pass without letting you know how much I have enjoyed the series of articles on " Steam Turbines " by Mr. D. H. Chaddock.

" On the all too rare occasions when we have a contribution from him, we invariably get a new angle on a problem or an excursion into uncharted waters. More power to his elbow (and pen).

" I, for one, am eagerly looking forward to reading the story of his adventures with the Mark II version, which I hope will materialise."

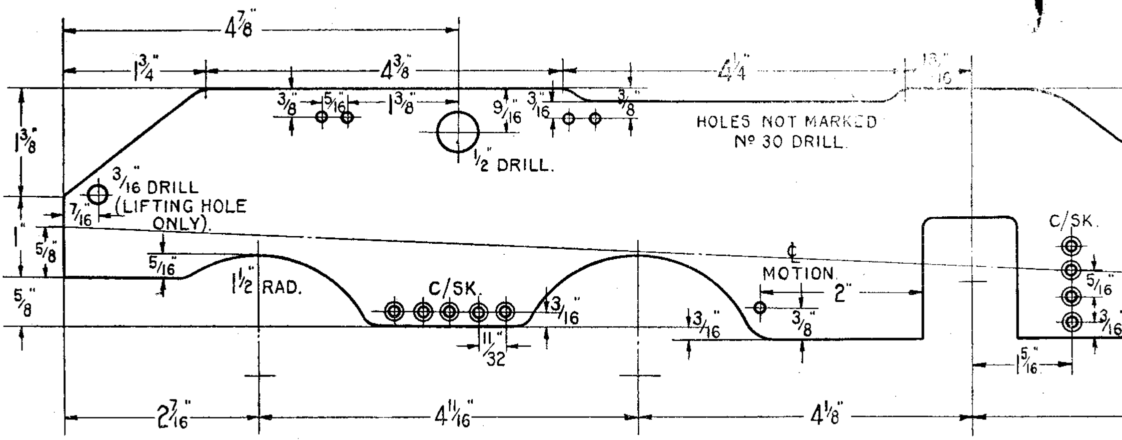
"Britannia" in 3½-in. Gau

THE first item needed for our genuine lion-and-wheel-brand job, will naturally be a good hefty pair of main frames; and you will notice, from the appended illustration, that they are all-present-and-correct-sergeant. Whilst the actual frames themselves differ little from the usual pattern—some of the "wise folk" were sure that bar frames would be used—the hornblocks are different to anything I have so far described in these notes, and there will also be a slight variation in the buffer and drag beams, and in the erection. For the actual frame plates, builders will need two pieces of ⅛-in. or 10-gauge mild-steel plate; whether bright or blue, doesn't matter, but it must be soft, and quite flat. The overall size if 24 9/16 in. long, and 3 9/16 in. wide; if our advertisers supply pieces cut to size, they should be a shade larger than the given figures, to allow for trimming. I need not go into full detail of how to cut out the frames, having done that with *Tich*; suffice it to say that one plate should be marked off, and the holes drilled, then place it on the second plate, drill two of the holes, rivet the plates together temporarily, and saw and file to outline. Use the holes in plate No. 1 as a jig to drill those in plate No. 2. Mark which is the outside of each plate, before parting them. Note that the tops of the axlebox openings should be rounded at the corners; and be careful to get the ends of the frame dead square with the top and bottom lines. No holes are shown for attachment of cylinders; instead of these being attached by set-screws put through the frames from inside, into the bolting face of cylinders, the latter are attached to the frames by flanges at the ends, as on the full-sized engines, and the holes in frames are located from those in the cylinder flanges.

Hornblocks

The hornblocks aren't hornblocks at all (says Pat) but steel flanges around the inside of the axlebox openings in the frame. This is similar to the way things are arranged on the big engine, simply modified to suit the smaller edition. This is how I did the job on my own engine, and it panned out O.K., no machining being required; thank goodness, says you! A piece of ½ in. × 1 in. steel bar (exact length doesn't matter; I just picked up an odd piece about 5 in. long from my oddments box) was rounded off at the top corners, to match the axlebox openings. Six pieces of ⅜ in. × 3/32 in. bright mild-steel strip, were then cut to a length of approximately 4½ in., and bent around the end of the piece of bar, forming flat-topped arches (Pat again) with rounded corners. Each of these was carefully fitted into an axlebox opening. To make certain they "stayed put" whilst the Sifbronzing job was under way, I put a strut in each one near the bottom. This was simply a 3/16-in. bolt just long enough to fit easily between the cheeks; and when the nut on the bolt was screwed tightly against the cheek opposite to the bolt head, the pieces of bent strip were very tightly held to the sides of the axlebox opening. That settled that!

Now I found I was up against a little problem. On the big engine, the hornstay, or frame keep, as they call these in full size, goes right across the bottom of the opening, and bolts to a flat seating at each side; there are two bolts inside the frame, and two outside. If I'd followed big practice, I could have used nothing bigger than 12-B.A. bolts; and as little *Britannia* is intended for a real job of work, same as her big sister—or "mum," just as you like—they wouldn't have lasted the proverbial five minutes, so something had to be done about it. Obviously, I couldn't put ⅛-in. screws endwise into a ⅛-in. frame; so instead of making my hornstay seatings as flat plates, I made them as blocks. The detail

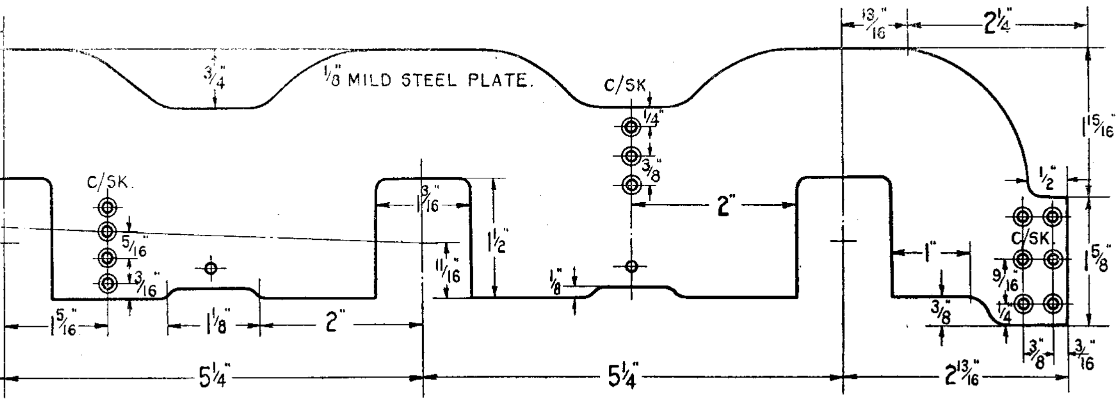


Details of the main f

n. Gauge by "L.B.S.C."

illustration explains. A piece of $\frac{3}{8}$ in. square mild-steel about 5 in. long was gripped in the machine vice on the table of my milling machine, and a $\frac{1}{8}$-in. slotting cutter on the arbor, soon chawed out a groove $\frac{1}{8}$ in. wide and $\frac{5}{16}$ in. deep for the full length, leaving the bit of steel looking like a weeny channel bar. This was chucked in the four-jaw, and twelve $\frac{5}{16}$-in. lengths parted off it. One of these was placed at the bottom of each side of every axlebox opening, close to the bent-

piece of bar by any of the methods described for cutting slots, in the *Tich* instructions; but one or more of our enterprising advertisers may possibly supply the bit of rod already grooved. The oxy-acetylene blowpipe is not essential, I used it because I always use it wherever possible; an ordinary one-pint blowlamp will do the job. Simply apply wet flux (Boron compo mixed to a creamy paste with water, is the best I have ever used for ordinary brazing) lay the job flat on a layer of fresh coke, or breeze, in the brazing-pan, and blow straight on to it with the flame, from the bottom end of each opening. This will cause the coke to glow under the little blocks and the bent strip; and the whole lot, including that part of the frame plate immediately around the opening, will rapidly become red-hot, when the



s of the main frames

up hornblock, or horncheek, whichever you like to call it. They fitted tightly on the frame, as the slotting cutter made the grooves exact to size.

Each frame plate was then laid in the brazing pan, and a fillet of wet flux put around the joints between the horncheeks and axlebox openings, and around the blocks. With a 150-litre tip in my oxy-acetylene blowpipe, and a $\frac{1}{16}$-in. Sifbronze rod, I was able to "solder" the whole blessed lot, a jolly sight easier than young Curly ever managed to manipulate a soldering-iron and "soft tommy"; and that long-haired enterprising tradesman knew the job, at that! I believe I've already related how I put the itinerant travelling tinker out of business—as far as our street was concerned, anyway—by repairing pots, pans, kettles, baths, and what-have-you, at very much below the "union rate," for the neighbouring housewives. It paid me, and it paid them, and everybody was completely satisfied, except the before-mentioned tinker; but nobody worried about him, for his soldering would have made an angel shed tears of spirits of salts, and he never thought of putting a neat little patch over a cluster of "pinholes."

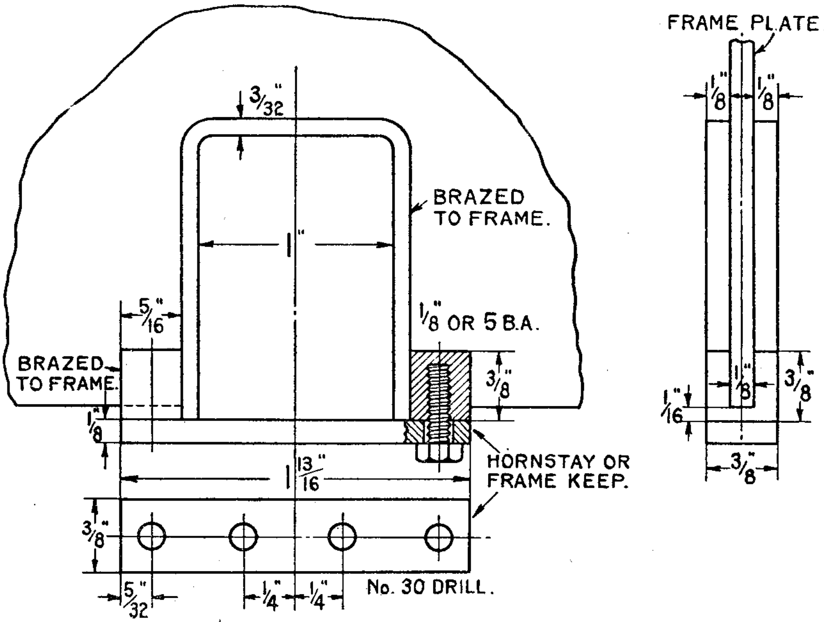
Builders who don't possess a milling, planing or shaping machine, can cut the slot in the

brazing strip can be applied. Coarse grade silver-solder may be used if desired, and only dull red heat will then be necessary. Don't make a mistake and put the frame in the pickle both afterwards, or you'll copper plate it; just let it cool to black, quench in water, knock all the superfluous burnt flux from around the joints, so as to keep the job neat, and clean it up a bit.

Finally, remove the strut bolts, grip each frame in the vice, and carefully file off any projecting bits of the bent strip, until they are level with the little blocks. Then try the piece of steel which you used for bending up the horncheeks, into each opening. It should fit fairly tightly in each one; if it won't go in, ease the side of each horncheek with a fine file, until it will just enter. There should be just the same amount, viz. $\frac{1}{8}$ in. projecting at each side of the frame, as shown in the end view of the assembly.

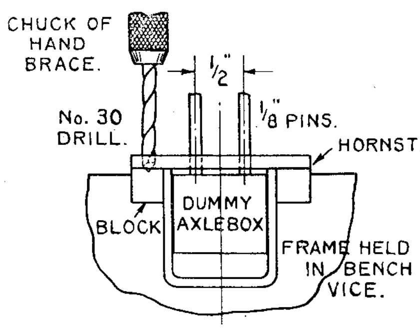
If anybody building this engine would prefer to use ordinary cast hornblocks, as specified for *Pamela* and other engines in this series of notes, there is no objection; but if you wish to use the ball bearings with them, you'll have to fit wide-jawed hornblocks, to accommodate the large axleboxes necessary to take the bearings. I

know our Scottish friend "Wilwau" has a pattern for these wide merchants, and believe Reeves has also; maybe our other approved advertisers could also oblige. However, plain bearings may be used "for the sake of simplicity" (apologies to a well-known catalogue!) and in spring pins are all drilled in a straight line, for use with the steel horns; but if cast horns are used, the end holes will be offset, same as *Pamela*. Don't forget to drill one first, taking care to mark it out correctly, and use it as a jig to drill the others. A simple jig can also be



Horns and stays

that case, the "standard" hornblock specified for *Pamela*, *Molly* and other engines can be used, cutting the openings in the frame, to suit. As *Britannia's* frames are set closer together than those of the engines mentioned, a washer will



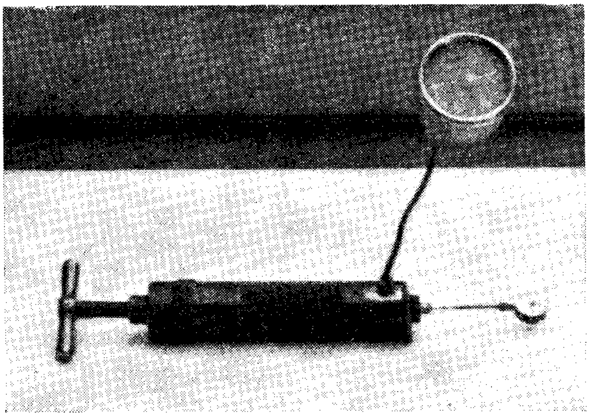
How to locate hornstays

have to be inserted between the wheel boss and the axlebox, but that will not affect the working of the engine in the slightest. Anyway, I'll tell you about that when we come to the wheel fitting.

The hornstays are just $1\frac{13}{16}$ in. lengths of $\frac{3}{8}$-in. × $\frac{1}{8}$-in. mild-steel strip, soft bright quality for preference. The holes for fixing-screws and used, to locate the hornstays correctly on the frame; it consists of a dummy axlebox with two spring pins in it, as shown in the detail sketch. Simply put it in the opening, with the frame in the bench vice; the pins, of course, pointing upward. Slip the hornstay over the pins. then put the No. 30 drill down each end hole, making countersinks on the little blocks at each end of the opening. When all the lot are located thus, drill out the countersinks with No. 40 drill, to the depth of the block, and tap $\frac{1}{8}$ in. or 5 B.A. The hornstays should then be interchangeable, although I always mark them, and keep each one to its own position, through mere force of habit. That little lot ought to keep *Britannia* builders busy for a couple of weeks or so, whilst I get out the drawings of the cradle frames, buffer and drag beams, bogie bolster and frame stays; and maybe it wouldn't be inopportune to remind all and sundry, that full-size blueprints will be available from our offices as the description of the job proceeds. Many folk find a blueprint handier than a small drawing.

Pressure-testing Gadget

A correspondent-friend up north, whose first letter dates back to the "Battle of the Boilers," recently sent me a replica of a useful gadget he rigged up for testing small pressure-gauges against a full-sized gauge. He said he found it so useful, that he thought I would like one,


Pressure tester made from grease gun

seeing that my own time is very limited. The device is shown in the accompanying photo - reproduction, and consists of a simple screw-down grease gun, as used for automobile work, with a pressure-gauge permanently attached to the barrel, and a union on the end for connecting to the small gauge, or whatever else is being tested. When operating, the barrel is filled with water, the greasy cup-leather on the piston acting as a seal; and pressure is applied by turning the screw. A very fine adjustment is possible, which is exceedingly useful when graduating a small gauge.

The gadget may also be used for testing a boiler by water pressure, provided that the boiler is first *completely* filled with water, before attaching the union, as an air pocket spoils the fine regulation, owing to the air being compressed. If anybody makes one up, there is just one point to look out for; the end of the screw, naturally, has to pass through the cup-leather and washers, so that it is free to turn, and that joint may be inclined to leak under high pressure. It did on the one my correspondent-friend sent, but the trouble was cured in a minute or so, by putting a slightly smaller cup-leather inside the original one. This had no hole in it, the pressure retaining it in place, so there was no chance of leakage at all. The higher the pressure, the tighter it holds.

The Model Car Association

At the recent delegate meeting held at Derby, a very good attendance was recorded. It was decided that the 1951 National Championships should be held at Cleethorpes, on September 2nd, and the Regionals on August 19th, as follows :—

North-West	Bolton
North-East	Bradford or Ossett
Midlands	Derby
South-East	Edmonton
South-West	Bath or Bristol
Scotland	Dundee.

The following open dates were also agreed :—

May 14th	Edmonton
May 14th	Sunderland
May 20th	Ossett
June 10th	Guiseley
June 24th	Derby
July 1st	Bradford
July 8th	Edmonton
July 15th	Bolton
July 29th	Cleethorpes
August 6th	Harrogate
September 9th	Bradford and "P.M." Trophy.

Further dates will follow as soon as available.

The 1.5 c.c. class is now official, and will be catered for in the National Championships.

The proposed grading scheme for open events was approved with slight alteration in the 5 c.c. class. Grade "B" in this class to be from 65 m.p.h. to 85 m.p.h., and Grade "C" to be up to 65 m.p.h.

The new constructional rules were accepted with some small alterations, as follows :—

3. (A) Not less than four rubber-tyred wheels shall be fitted.

3. (B) Wheels on the same axle shall be of *equal* diameter, and type.

4. (D) The wheelbase of the car shall not be less than $2\frac{1}{4}$ *times* the diameter of the larger wheels.

10. (B) All parts shall be securely fastened when running, and any car dropping any major part, *except tyres burst and lost during running* shall be disqualified from the run, unless timing has already been completed.

The sub-committee were thanked for their efforts on behalf of the sport, and have agreed to meet again to formulate a set of competition rules, together with duties of officials at Opens. The annual general meeting will be held on March 18th, at Derby, and it is hoped to hold an ordinary meeting prior to the annual general meeting to deal with a further sub-committee report.

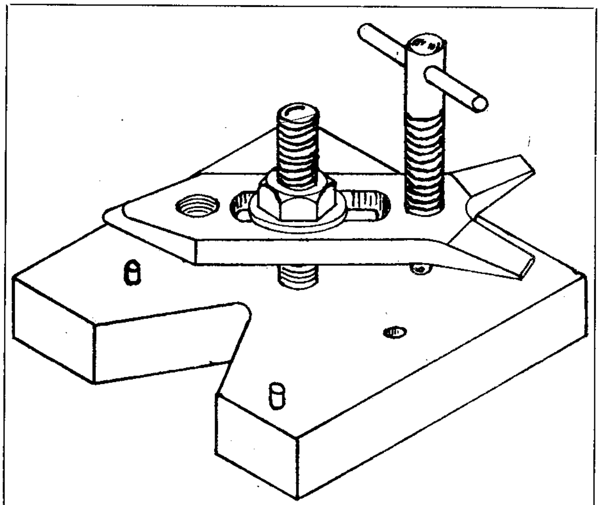
New cables, suitable for 9 in. bridles, will be available shortly. Official speed charts recording from 50 m.p.h. to 150 m.p.h. by 1/100 second, are now available through club secretary, price 9d. each. In spite of many rumours that the Liverpool English Electric Club will hold an indoor open shortly, there is nothing official yet. Thanks are due to Bill Moore for his efforts on our behalf in obtaining the lecture, with slides, produced by the American expert, Howard Franks. Clubs wishing to loan the lecture should get in touch with I. W. Moore, 3, Friary Close, 2, Bridge Street, Derby.

Hon. Secretary: G. E. Jackson, Lime Grove, Chaddesden, Derby.

A Forgotten Workshop Tool

by Commander W. T. Barker, S.M.E.E.

WHEN I was a boy serving my time, now nearly 50 years ago, many of the older hands in our tool-room carried a useful little gadget in their kits known to the tradesmen of that day as a finger plate. It was also sometimes called a tool-maker's flat vice. It seems odd that so handy a tool should have fallen into such complete oblivion, but I daresay its disappearance coincided with the coming into vogue in the early 1900's of the attractive little, so-called tool-maker's vices, put on the market in pairs by American firms like Brown & Sharpe, Starrett and others which beguiled so many of the ignorant and unwary, myself included, into wasting good money on an article of more ornament than real use.



Sketch No. 1. Finger plate, normal type

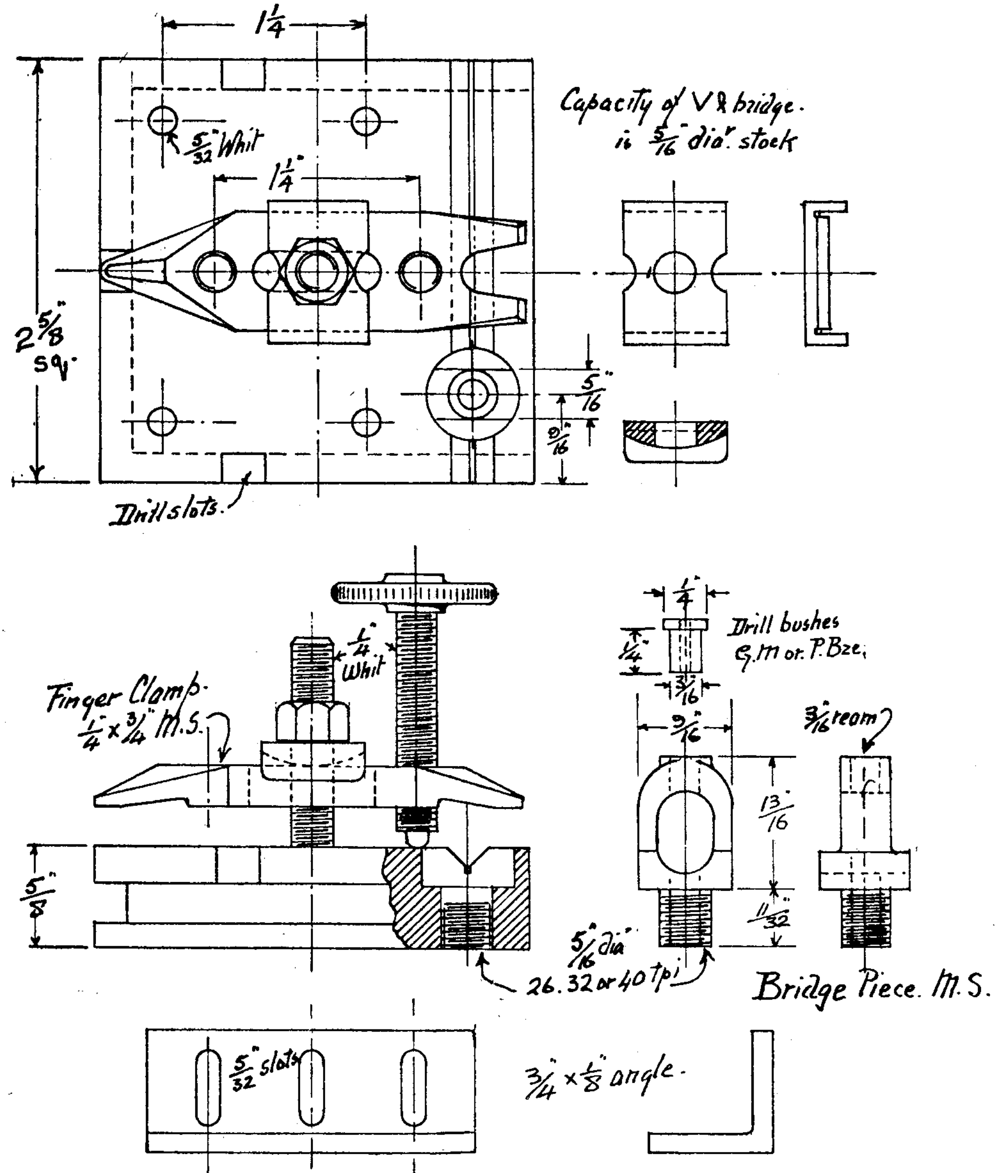
Be that as it may the finger plate seems entirely lost sight of today and indeed modern production methods hardly need this kind of thing so far as industry is concerned, but for the amateur mechanic and model engineer it might be another story and a hark back to the past could put a really useful and easily home-made tool into his hands.

In its simplest form the finger plate consisted of nothing more than a metal block 3 or 4 in. square and $\frac{1}{2}$ in. to $\frac{5}{8}$ in. thick having a screwed stud in its centre carrying an adjustable finger clamp with a pinching screw, and its main function was to hold pieces of work of awkward shape, or too small to be securely or safely held by hand, for drilling, tapping or other operations.

Sketch No. 1 shows a general view of the old-style finger plate which when well and accurately made had a variety of other uses. The base was usually of cast-iron, with its two faces flat and parallel and all edges square with one another and with the faces. In one edge a V-notch provided drill clearance and sometimes a V-groove was added along another edge for gripping round stock. The finger clamp had a sliding adjustment with a pinching screw which could be inserted in either end enabling either one or two fingers to be brought to bear on the work as required. Also, as and when required, small holes might be drilled here and there in the baseplate into which stop pins could be inserted to prevent twisting of work under the action of tap or drill.

A finger plate of this type can securely hold small and awkwardly shaped components of a model on the drilling machine table incidentally saving the model-maker's hands and fingers from risk of injury, or on the surface plate for marking off in any one of five planes at the same setting or it can itself be held in the bench vice to carry out filing and other hand operations hardly possible in any other way.

After nearly 30 years in regular use in my workshop a small finger plate very similar to the sketch with a base $2\frac{1}{2}$ in. square by $\frac{1}{2}$ in. thick was getting worn and inaccurate, and I recently made myself a new one incorporating one or two additional features which experience led me to think would increase its usefulness. The new one is shown in clear detail in sketch No. 2 with a few of the principal dimensions, as it may be that some of those reading these notes may think it worth while to make one for themselves. If any do so, however, I should strongly advise them to think carefully before just making a more or less exact copy of my design. A tool like this is very personal to its user and details depend much on the type and size of the work done. For instance, because my work is rather small I have eliminated the V-notch shown in sketch No. 1 in favour of 3 small slots for drill clearance in the upper edges. For larger work or more general use the notch might suit some users much better. Again some might think the V-groove and bridge for drilling holes centrally through round stock of unduly small capacity as shown. If made larger it would entail enlarging the whole finger plate to accommodate it. Others may find so little use for this accessory that it would be hardly worth while to include it. In a word, my adivce to anyone intending to make himself a finger plate would be to use the general idea, but adapt dimensions and details



Sketch No. 2

to his own needs. This is what the craftsmen of my boyhood days did. One seldom saw two exactly alike, and to illustrate still more clearly how difficult it is to adapt oneself to the ideas of someone else in this respect I might add that once, many years ago, I picked one up from a junk shop—the only time in my life I ever saw one for sale—it cost me 1s., I think. It was very nicely made by some old timer, possibly a brass finisher as the screws used in it are 26 t.p.i. and the baseplate is fitted with a renewable brass face. It had seen hardly any use, and—and this is the point—it has seen none since I bought it. It didn't suit my ways at all, and has lain unused on a shelf ever since. It seems possible that it is this queer personal factor that seems to attach to the finger plate that prevented it ever becoming a merchantable tool. It is so easy to give effect to one's own ideas, that there was no demand for a standard type.

For the benefit of those, if any, who decide to make such a tool I will add a few comments on one or two constructional details.

(*Continued on next page*)

A PORTABLE "WORKSHOP"

HAVING moved my residence and recently married into the bargain, my 2½-in. "Enox" lathe fell into disuse. The possibility of having an outside workshop as previously enjoyed was remote, also was the possibility of one inside, as we live in a flat. A chance remark one day by a new-found friend led to the purchase of (for £2) an *ex*-Singer sewing machine stand with treadle. With much thought and surprisingly little juggling, it was converted from a right-hand "headstock," as used on a sewing machine, to a left-hand headstock for use with the lathe.

A small pulley was turned from wood to give an average mandrel speed and was bolted to the existing flywheel—which, incidentally, did not need "loading," as when I sit down to work, both feet can be used on the treadle, hence obtaining a "double-acting effect."

The lathe was mounted on a piece of ⅝-in. plywood which fitted snugly into the top of the table, and was held securely in place by a simple clamp and a few nuts and bolts.

Singer belting (¼ in. round) was used (second-hand variety because it was stretched, pliable and cheap).

A small hand grinder of German origin was next built in—this being mounted on a piece of 4-in. channel section iron, sufficiently long to be used as an anvil as well. Also, a 2½-in. Record vice was simply bolted on.

Then the question of storing the host of small tools, that are used by a model engineer, cropped up. For obvious reasons this set-up has to be self-contained and portable. In the end, I used a cabinet that was made for me at a tender age to keep my "Meccano" set in; this was found to be ideal, as it was fitted with drawers. It was duly slung by means of a few more nuts and bolts after being reinforced, and the job was completed by the addition of a light aluminium chip tray.

In conclusion, this has not anything like the power of a ¼-h.p. motor, but on the other hand I am now able to pursue my hobby once again, under congenial surroundings (by the dining-room fire or in the kitchen).

The whole thing is stored in a "locker" along with much other stuff one very soon accumulates.

I am now christening the workshop with a ¾-in. scale free-lance traction engine, which, incidentally, bears a striking resemblance to Commander J. B. Mitford's engine described in a previous issue of THE MODEL ENGINEER.

I hope the above may help someone to start or resume his model engineering activities.

—A. D. CARNE.

A Forgotten Workshop Tool

(*Continued from previous page*)

1. The Baseplate

The metal should not be too soft, but on no account case-harden it. Cast-iron, mild-steel or a bit of hard bronze. My recommendation would be to use cast-iron if you can get it. It should be machined all over as truly flat, parallel and square on both faces and all four edges as workshop equipment will enable you to achieve as on this accuracy its usefulness as a marking off jig wholly depends. Unless, however, the worker has to rely on a file to make his baseplate there is no need to scrape up to a surface plate finish. The undercuts round three sides are a convenience and not critical as to size or shape and if an iron casting was made they could be cast in. Their purpose is to enable the finger plate to be clamped down to faceplate machine table or bench on occasion, while still leaving the working surface unobstructed.

2. The V-Block Fitment

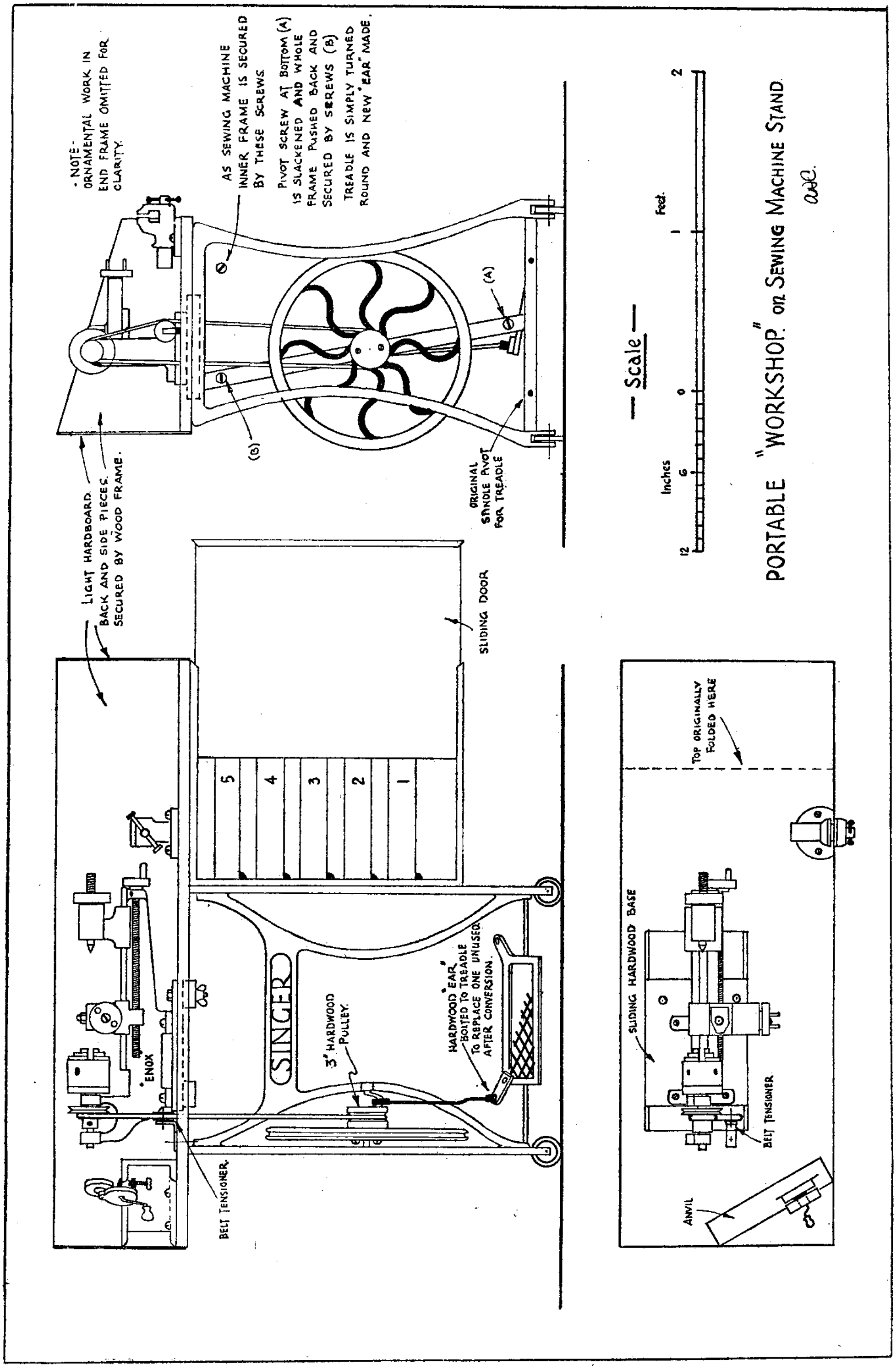
If it is proposed to include this item great accuracy and care is necessary if it is to be of value. Bore and thread the housing for the bridge piece in the baseplate, and machine or file out the V-groove afterwards so that it is both exactly central in the housing and parallel with the edge of the base. After the bridge piece has been screwed, bored, slotted through and screwed tight into place the two flat sides should be finished off square with the baseplate edge and to an accurately known distance from the drilling centre. This will enable exact placing of holes through the stock to be drilled by measurement from the edges of the bridge.

3. Case or Other Hardening of any Components.

Avoid it like the plague. If you attempt hardening of finger clamp, bridge piece, angle-plate or bushes they will only become distorted and inaccurate, mar your work and damage your tools. In small sizes bronze drill bushes are far better than hardened ones, and are easily renewable.

4. Angle-Plate

This is an optional fitment and everyone may not need it. A short length of ¾ in. × ¾ in. × ⅛ in. mild-steel angle would be suitable. It should be accurately squared and arranged for attachment square to the baseplate edges in two positions by two 5/32 in. screws in the two outer slots while by using one screw only in the central slot, it can also be fixed at an angle. Its purpose is to enable the finger plate to stand up on one or other edge on the drilling machine table and remain stable under drill pressure while holes are drilled at right (or other) angles to one another without altering the setting of the work on the baseplate. It will also facilitate angular marking off.



PORTABLE "WORKSHOP" on SEWING MACHINE STAND

Sunshine Indoors

Easily Made Photographic Floodlights

by R. Harries

THE amateur photographer, once really interested in his hobby, soon becomes dissatisfied with limiting his photographic efforts to that time of the year when the sun shines brightly and he yearns for some form of artificial lighting, which would enable him to take indoor portraits, still life compositions or technical subjects.

If he is capable of using a few simple hand tools, then there is no reason why he should not construct for himself floodlight units at a small cost and which will satisfy all needs. The writer has recently built himself a pair of floodlight units, the design of which is passed on herewith for those interested.

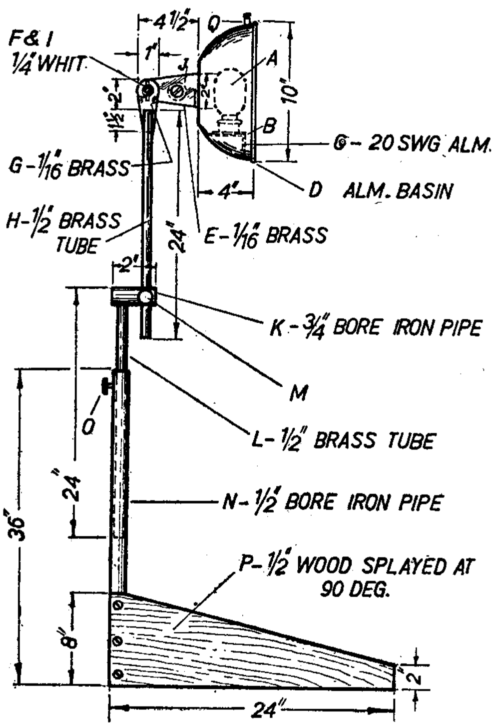


FIG. 2

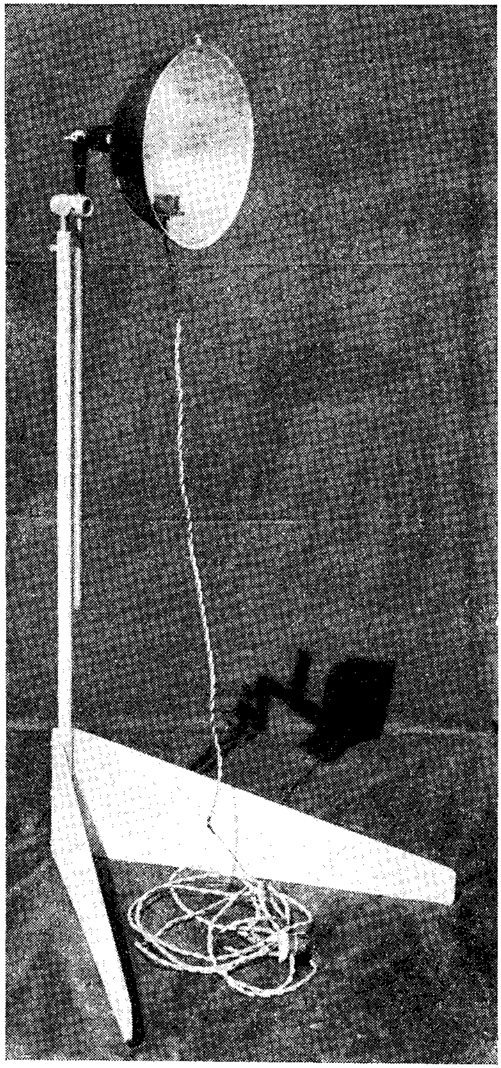


Fig. 1. The stand floodlight unit

Type of Lamp Used

The photograph, Fig. 1, gives a general impression of the unit and a more detailed side view is to be seen in the drawing, Fig. 2.

The now common photoflood lamps were not used in this unit since their burning life is rather short, especially if one dawdles over the arranging of the lights. The lamp used was the class A.1, 500-watt projection lamp with the E.S. cap, and intended for vertical burning with the cap at the bottom. This lamp is a clear one and therefore handy for use when harsh directional lighting is required. For softer lighting a diffusing screen is placed in front of the lamp.

It is not recommended that this lamp be burnt for long periods tilted over at a steep angle, other-

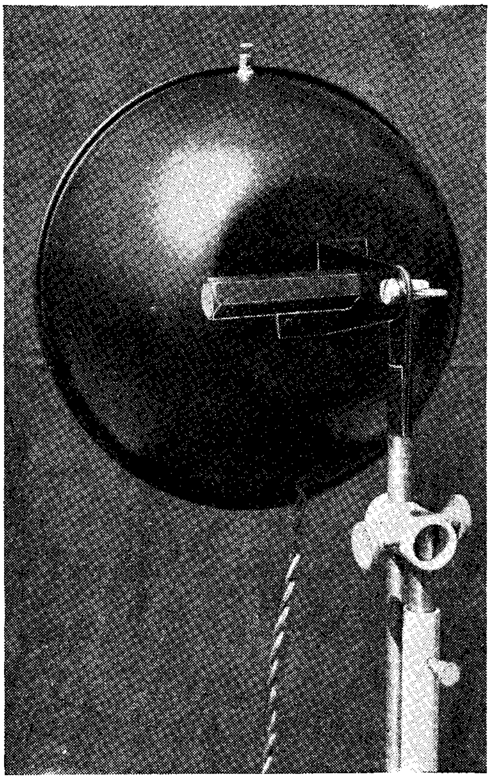


Fig. 3. Rear view of reflector and coupling

wise its useful life will be reduced. Up to 35 deg. each side of the vertical is tolerable.

Constructional Details

Referring to the figures already mentioned, the projection lamp (*A*) is carried in its batten holder (*B*) which is screwed to the platform bracket (*C*). (*C*) is riveted to the reflector (*D*)—the latter being an aluminium basin obtainable from any ironmonger. Riveted to the back of (*D*)

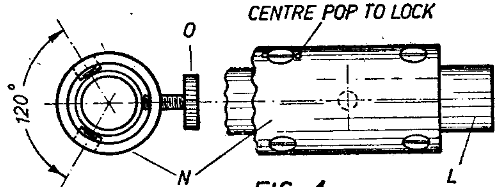


FIG. 4

is a flat arm (*E*) which pivots about screw (*F*) on the flat extension (*G*) to the tube (*H*). A wing nut (*I*) locks the reflector in any angular position. As the reflector gets hot in practice, an insulated extension handle (*J*) is screwed to the arm (*E*).

A short piece of tube (*K*) carries two holes—one to receive the tube (*H*) and the other to accept the end of the tube (*L*). Locking (*H*) and (*L*) is done by means of two finger screws (*M*) entering threaded holes in (*K*) to bite on the tubes. The above details are clearly seen in the photograph, Fig. 3.

Tube (*L*) slides through the bore of another tube (*N*). It is most unlikely that a tube will be available for (*N*), having a bore to match the outside diameter of (*L*) so it is suggested that one

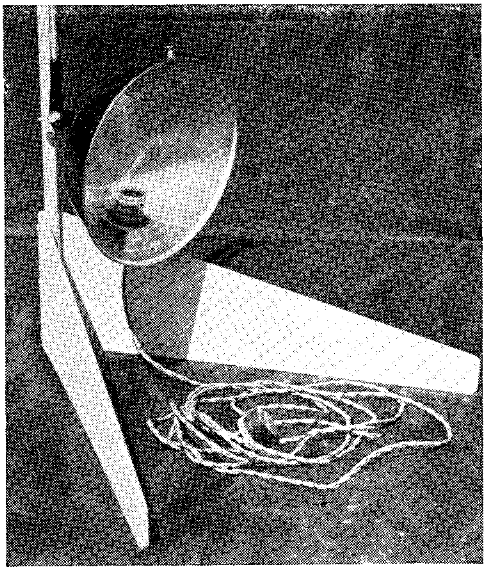


Fig. 5. Flood unit set at lowest position

be selected a sloppy fit around (*L*) and that four grub screws be threaded into (*N*) near the top so that they form four pads against which (*L*) will seat when coerced by the clamping screw (*O*), Fig. 4.

Such an arrangement as the above is technically sound as it provides correct geometrical constraints and so wobble-free clamping and freedom of sliding even if the tube (*L*) is out of round or straightness.

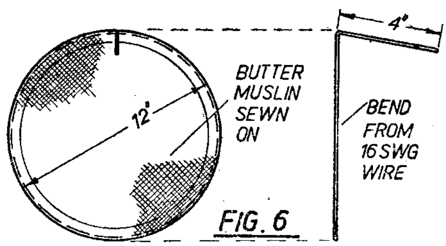


FIG. 6

Since the main weight of the lamp and its fittings overhangs the pillar (*N*) on one side, the two feet (*P*) can splay out on this same side so as to bring the centre of gravity well inside the base figure. The feet are of wood and are screwed to (*N*).

The shape of the base enables one stand to nestle closely into another, thus permitting close

grouping of the lamps provided their heights are staggered so as to clear each reflector. The same feature also allows storage in a small space.

Range of Adjustment

A feature of this stand design is that the lamp can be set at any height from floor level up to the maximum draw of the two tubes (*H*) and (*L*). To reach from the position shown in the photograph, Fig. 1, down to floor level, the tube (*K*) together with the attached reflector unit is turned upside down on the tube (*L*), the reflector is swung right over to the other side and the tube (*H*) twisted through 180 deg. This brings the lamp into an upright burning position with the cap down, a desirable setting for long burning life of the lamp. The lowest position possible is shown in the photograph, Fig. 5.

Without a diffusing arrangement the light is too harsh for portraiture so a telephone terminal (*Q*), Fig. 2, is attached to the top of the reflector (*D*) to carry the extension of the wire ring, Fig. 6, on which is sewn a disc of butter muslin or similar diffusing material. The diffusing disc hangs an inch or so clear of the reflector.

At least two of the above lighting units will be required for normal arrangements, in addition to possible spotlights and overhead units.

For the Bookshelf

The Railway Photographer. (Published at 28, Hill Road, Weston-super-Mare, Somerset.) Price 1s. 6d. per copy.

This is a new periodical which is to be published quarterly to cater for those who are interested in railway photography. We have been favoured with a copy of the first issue and we find it a well-produced brightly written, 24-page magazine that should have a wide appeal. A good quality paper ensures that full justice is done to the reproduction of the excellent photographs, while the chatty articles make pleasant and instructive reading.

Four Main Lines, by C. Hamilton Ellis. (London: Allen & Unwin Ltd.) 224 pages, size 6 in. by 9 in. Eight coloured plates and numerous half-tone illustrations. Price 16s. net.

This book deals fairly comprehensively and not a little personally with the history of the four railways which came to serve Britain's needs after the grouping of the railways in 1922. Each is given a part of the book to itself, and its early history is more or less elaborately sketched.

The style of writing is what we have come to expect from this author, and adds a strong element of entertainment in addition to the interest of his text. For example, in a description of the booking-hall at the Waverley station at Edinburgh, mention is made of the mosaic pavement with the North British Railway's coat-of-arms at each corner; one of these coats-of-arms is cracked right across, and the author comments: "how one could have cracked that massive device by any means short of dropping a battleship on it passes comprehension." Such touches as this enliven many of the pages and provide enjoyment for the reader.

The eight coloured plates have been well produced, and they reveal some painstaking research on the part of the author-artist; we note a tendency to somewhat exaggerated perspective, as though the scene were viewed through a wide-angle lens, but in other respects these plates are highly satisfactory.

The photographic reproductions, several of which date from very early times, are full of interest, though, in our copy, a number of them have been ruined through excessive zeal for the modern bled block having led to over-mutiliation of the pictures.

As a record of an important epoch in our railway history, this book cannot fail to find favour with most railway enthusiasts and many other readers.

Rust Solvent and Protective Oil

WE received recently from Messrs. Dex Industries Ltd., "Wee Dex" Works, Edwin Road, Twickenham, Middx., samples of their "Aero C" rust solvent and "Metlgard" protective oil.

For derusting, the parts are sprayed, painted or dipped in "Metlgard" and allowed to stand five to six minutes. Brushing with a soft wire brush (or hard bristle) will remove all but the heaviest rust in one treatment and will leave a protective film which dries hard and does not smear when handled.

Other uses recommended for "Metlgard" are for breaking rusted joints, derusting engine cylinders and for the protection of parts in storage.

Being a fluid oil, "Aero C" is quite easy of application. It can be sprayed or brushed on, according to the nature of the surface being treated. Small articles can be dipped and then allowed to drain. In the case of "top" rust, cleaning with a high-speed rotary scratch brush or with fine "O" steel wool can then be done immediately. The application of "Metlgard" to parts treated with "Aero C" will prevent further attacks.

"Aero C" and "Metlgard" are obtainable from the makers at the following prices:—

3-oz. cans, 1s. 6d.; ½-pint cans, 2s. 6d.; 1-pint cans, 4s. 2d.; 1-quart cans, 8s. 4d.; ½-gall. cans, 16s. 3d.; 1-gall. cans, 32s. 6d.; 5-gall cans, 32s. 6d. gall., plus 6s. cost of can.

200,000 R.P.M.—by K. R. May

THE title of this article is not a misprint or an engineer's nightmare but is a rotational speed which can be achieved by anyone who has the use of both a lathe and a good supply of compressed air. Even if only a modest supply of air is available, extremely high speeds can still be held. In default of compressed air, high-pressure steam can be used. This spinning device was originally developed as a scientific instrument for laboratory use in such applications as ultracentrifuging and spraying, but it is presented here as a fascinating and entertaining toy which the model engineer will find to be something quite out of the ordinary, and yet simple to make.

Essentially, the device consists of a rotor shaped like a child's top, and with a number of flutes cut on its underside. Jets of air from the stator impinge on these flutes to provide the rotational force, and are so angled that they support the rotor as it spins. Thus there is no bearing friction and the rotor will go on spinning at fantastic speeds indefinitely without the slightest wear, there being nothing to wear out!

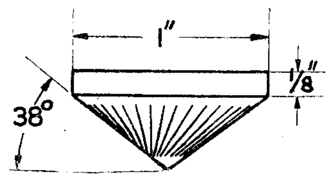


Diagram 1—*The rotor*

The behaviour of a small piece of metal rotating at high speed is fascinating and sometimes alarming.

Jerk it out of the stator on to a plate, and it will continue spinning on its sharp point for many minutes. File down this point to a small flat and on being dropped on a hard floor the rotor will chase madly round for a long time, rebounding with entertaining violence from anything it touches. Place a large ring round it and stand clear.—it's dangerous! The stability of a correctly made rotor in a correctly made stator is quite surprising. For example, with an aluminium rotor it is possible to turn the stator (held in the hand) slowly over until the rotor is spinning quite happily upside down with no visible means of support. A full understanding of this paradox requires a knowledge of hydrodynamics, and it is only in the scope of this article to say that the high velocity of the driving jets and the shape of the gap between the rotor and stator give a sub-atmospheric pressure below the rotor so that it is held into the stator by suction. This suction is quite large and is readily felt by placing the thumb in the stator with the air turned on.

It is of interest to relate that smaller rotors than the one to be described have been spun up to 7,000 revs. per second, by using compressed hydrogen instead of air. Hydrogen has a lower viscosity, and so gives higher jet speeds and less frictional drag on the upper parts of the rotor. At speeds in this region steel rotors explode and with great violence, because the rim of a 1 in. diameter rotor is then travelling at about 12,000 m.p.h. so that the pieces have the velocity of a bullet. The centrifugal force at the rim causing disruption at such speeds is about one and a half million times that of gravity. Steel and aluminium alloy rotors are safer than brass, and it is probably unwise to spin brass ones faster than about 3,000 r.p.s. Even at this speed it is as well to be cautious and keep a brick between the rotor and one's stomach!

The table below shows the general performance figures. It will be noted that, at the higher pressure ranges, air consumption is heavy and several horse power is required for continuous running. However, the storage capacity of the type of reservoir commonly fitted in a garage tyre pumping unit, for example, is sufficient to enable a very high speed to be reached before the reservoir is exhausted. To run the device on steam at a pressure of 50 lb. per sq. in. would require a water evaporation rate (unless my arithmetic fails me) of very roughly 1/5 pints per minute, that is a heat supply of 4 KW, or 5 h.p., neglecting heat losses. Very high speeds with steam are therefore probably beyond the reach of the average model engineer, but more modest speeds in the region of 1,000 r.p.s. should be attainable.

Machining the Rotor

In diagram I, a 1 in. diameter rotor is shown. Aluminium will give the highest speeds, but a light rotor may be less stable than a heavier one. At the expense of speed the diameter may be

Working air pressure lb. per sq. in.	2	5	10	20	40	70	100
Air consumption cu ft. per min.	0.4	0.9	1.4	2.2	3.5	4.6	6.3
Revs. per sec. with 1½-in. alum. rotor ..	200	450	820	1,270	1,800	2,200	2,400
R.P.S. with 1-in. brass rotor	300	650	1,150	1,700	2,300	2,800	3,100
R.P.S. with 1-in. alum. rotor with milled flutes	350	750	1,300	1,880	2,550	3,260	3,650

increased to 1½ in. to obtain real stability in starting, when a 1-in. rotor sometimes requires the guidance of the fingers.

The number of driving flutes is not critical and I have found anything between 30 and 40 to be equally good and the range is no doubt wider than this. The flutes are bisected at an angle of 20° by imaginary radial lines from the apex of the rotor, so that the air jets strike the flutes at right angles to their length. In the very simple flute-shaping method described below the grooves should be shaped and positioned in such a way that the side struck by the air jet presents a shallow, flat surface for the jet to act upon, remembering that the rotation is clockwise, as seen from above the rotor. The method gives very shallow cuts but these are quite satisfactory.

In what follows, it is assumed that the lathe is fitted with one of the conventional dividing attachments. The work is first turned to the required base diameter and then to the cone angle of 104° with the compound slide at 52°. Next, the flute shaping tool is mounted with its tip at ⅛ in. above centre and the compound slide turned back through 109° and set at 57° (on the other side of the zero). The saddle is then adjusted by trial and finally locked in the position where a traverse of the compound slide scores out a groove of the required length (⅜ in. to ½ in.) on the side of the rotor cone remote from the operator, the chuck being locked by the dividing attachment. The process is repeated every 12°, say, until all flutes have been cut. The rotor may then be parted off and is ready for use. No balancing is required as the rotor finds its own centre of rotation in the air jets.

A better finish to the flutes is obtained by doing the job in a universal milling machine using a dividing head and, say, a 2 in. diameter milling cutter, or with a milling motor attachment to the lathe. The resulting rotor runs a little faster than the one described above, as the flutes can be cut deeper to give more "bite" to the air jets. Do not exceed a depth of 1/32 in., however, or the rotor may run unsteadily. Milled flutes should be about half way up the coned face of the rotor and need not be longer than ¼ in. Their slope should give a similar appearance to diagram I, which shows the flutes cut by the first method.

Machining the Stator

This is a job requiring great care, as the jets must be at the exact angles and position shown in diagram 2. Any small error may mean that the rotor will not run. While there are probably other jet settings which work well, those shown in the diagram are known to be very good in practice, so stick to them as closely as possible. A tolerance limit of ±.005 in. should be aimed at for the jets. An initial difficulty experienced by some is the visualisation of the stator in three dimensions from the drawing, but this should become clear as the machining progresses.

The first operation is to turn up the underside of the stator from brass, the included angle of the coned portion being 91°. The stem has a diameter of ½ in. and the hole through the centre, the function of which is explained later, is made with a ⅛-in. drill. The end of the stem is threaded for about ½ in. with any convenient thread. The four jets are next drilled out from the underside of the stator, without removing the work from the chuck. To do this a jig is essential to guide the drill and to ensure that all jets are identical. A simple and effective jig can be made from, say, a ½-in. × ½-in. brass bar which can be clamped in the toolpost. At the end of the jig a guide hole is drilled at 55°, and the underside of the jig is so shaped that the lower end of the

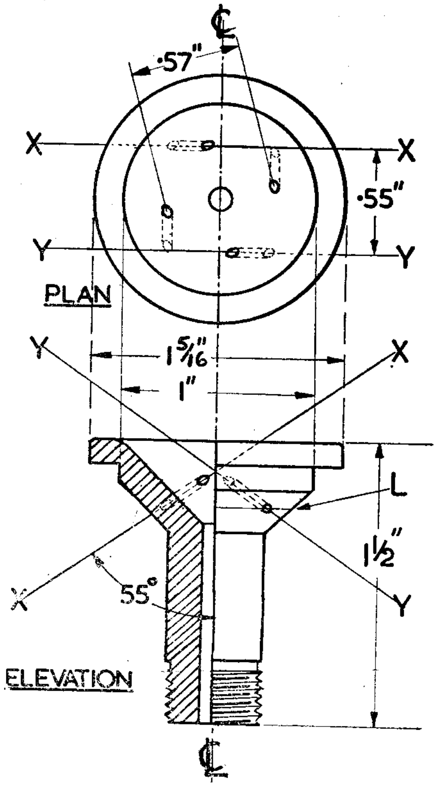


Diagram 2—The stator

guide hole can lie flush against the coned part of the stator. Round the stator cone is scribed a circle with a diameter of 0.75 in. which is shown in the half sectioned elevation as the line *L*. It is on this line that drilling of the four jets commences. When the jig is set up correctly the guide hole must :—

(*a*) be on the line *L*.

(*b*) lie in a plane which is parallel to the axis of the mandrel and accurately vertical with respect to the lathe bed.

(*c*) be at an angle of 55° to the horizontal as measured in that plane.

(*d*) be offset *towards* the operator to a distance of 0.275 in. from the lathe centre.

As the whole success of the device depends upon these settings the jig adjustment must be made very carefully before locking it in place The offset distance of 0.275 in. is half of the distance shown between the lines *XX* and *YY* in the plan view of the stator. These lines are the axes of two of the four jets and in the elevation *XX* lies below the plane of the paper and *YY* above the paper. The guide hole and the jets are made with a No. 65 drill (.035 in.) or with a diamond pointed drill of that size. Drilling

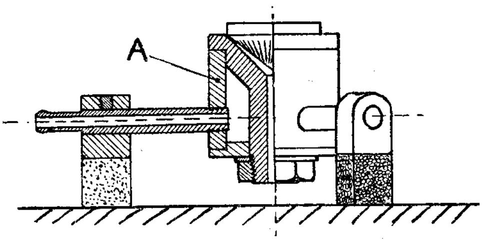


Diagram 3—Assembly

should be done to a depth of at least ⅛ in. into the cone, a small hand brace being suitable. In drilling a jet the chuck, of course, is locked by the dividing attachment and the four jets are drilled every 90° without touching the setting of the jig. It is, of course, possible to drill the jets on a universal milling machine without using a jig.

Having completed this job the work may be parted off, reversed, and mounted in a collet or accurately centred in a 4-jaw chuck so that the stator cup may be turned out. The included angle of this cone is again 91° and the turning out is continued until the centres of opposite pairs of the emerging jet holes are 0.57 in. apart as shown by the dimension at the top of the plan view of the stator cone. Both edges of the cone are next given a small radius and the stator is complete.

The rest of the job is very straightforward and should be clear from the half sectioned diagram 3 which shows the assembly. The cylinder *A* has a bore of 1 in. and may be made in any convenient material, but a light alloy is the most suitable. The base is held on by the nut at the bottom which is screwed up tightly so that the compressed air can only escape through the jets. Thin rubber or fibre gaskets may be used if necessary.

Screwed into the side of the cylinder are the three equally spaced legs, two of which are solid and the third, as shown, is a tube for connection to the high-pressure supply. The legs are 1½ in. long and are shown as ¼ in. o.d. but any reasonable diameter may be used. The feet at the end of the legs are most suitably made from a light material such as aluminium or a plastic and ½-in. cubes of sponge rubber are stuck to the underside.

A worthwhile, but not essential, refinement is shown in diagram 4. This is a small valve built into the stem of the stator which prevents any flow of air down the central hole. When the rotor is running normally the low pressure between the rotor and the stator sucks a current of air up the central hole, and this is an essential feature of the design for the rotor will not run at speed with this hole blocked. When starting and stopping, however, only a pound or two of air pressure is used and this is not sufficient to overcome the weight of the rotor so that air flows down the stem. The rotor then flutters about so that it is not self-starting without the valve and the fingers have to be used to steady the rotor as it accelerates. With the valve in place the rotor will readily start by itself if care is used in turning on the air supply. Naturally a fairly sensitive control is required for this purpose. The stem valve must be made of very light material such as "Tufnol" and be very free in movement so that it lifts easily and gives no obstruction to the upflow of air. To this end generous notches are cut in the top of the valve to form air channels when the valve is forced to the top of its chamber. A convenient size for the valve head is ¼ in. diameter × ⅛ in. with a stem of $\frac{1}{16}$ in. × ⅜ in.

Although the sponge rubber feet should be quite satisfactory, by far the best support for the device when it is running is to hold it in the hand. This is because the hand has a powerful damping effect on any self-induced vibrations in the device and sometimes a temperamental rotor will only run when the assembly is so held. An almost perfect support can be made by mounting the body on a spring or springs, the whole being in an oil-filled dashpot, but this complication is not necessary for the simple form of the device described in this article. It is usually fatal to clamp the body down in any way.

When running, the rotor should be rock-steady and completely free from vibration so that it appears stationary to the eye. It emits a clear note with a number of overtones. The frequency of the fundamental is the same as the rotational speed and this fact gives a very quick and accurate method of measuring the speed of the rotor if one has a calibrated audio-oscillator. One simply tunes in the oscillator to the fundamental, a strong heterodyne beat being heard when coincidence is obtained. The calibration of the oscillator then gives the rotor speed directly. This equipment, however, will certainly not be generally available, and the figures given earlier on in the table should satisfy all but the most exacting.

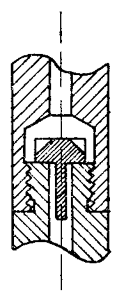


Diagram 4 — Stator valve

I conclude with a word of warning—do not make rotors in any other material than good quality metal. Strains in the rotor are so great when running that any material of low or doubtful tensile strength will be very liable to burst. When this happens there is no warning, and the rotor vanishes with a bang. So stick to steel, brass or light alloy.

PRACTICAL LETTERS

Camera Construction

DEAR SIR,—For many years I have used a 620 Kodak camera with an O.P.S. shutter and f. 4.5 lens.

This camera has given every satisfaction within its capabilities and many hundreds of photographs have been taken with it.

It is not a suitable camera for photographing models or small objects, as the minimum focal distance is 3 ft. 6 in. A supplementary lens has been added reducing the focal range to 2 ft., but I have been unable to obtain really sharp pictures with this lens fitted.

At such close range the viewfinder is useless and running a straight edge along centre lines of camera and object to be photographed is not very satisfactory, though I have taken some excellent photographs like this. Recently I had occasion to look at a second-hand photographic dealer's premises and was amazed at the price now being asked for second-hand field cameras, and I have had some ideas about making one myself. The recent article on making a small camera is the only one I can ever recollect seeing in the pages of the MODEL ENGINEER. We have had many articles on projectors, etc., and I should like to see a similar type of article on camera making.

The particular type of camera I would like to build would be solely for the purpose of photographing models indoors. Its range must be to fill the negative used when photographing an object 2 in. square, and to photograph an object 4 in. long within the compass of an ordinary room about 12 ft. square.

Speed is not important and time exposures with small stops and photoflood or daylight lighting will be used.

I propose using plates as I often wish to take a photograph and develop it immediately. With my present camera I often remove the film and substitute a plate in its place for a one off job.

I propose using a $3\frac{1}{2}$-in. × $2\frac{1}{2}$-in. plate. I should prefer $\frac{1}{4}$ plates, but they are much more expensive and need a much larger enlarger, etc. I prefer a rectangular picture to a square one. I do not like miniatures. The size suggested gives a reasonable size of contact print when necessary. I do not know if smaller plates are obtainable. A roll film adapter will be considered, but single plate dark slides must be used.

The camera will not be fitted with a rising or sliding front or swing back, though the advantages, especially of the swing back, when photographing long objects at close range are well known. A rising front means that bellows must be used, and I do not like bellows and I don't fancy having to make a set. I propose using a sliding tube system for focussing. A focussing screen will be fitted to be replaced by dark slides. I have tried all types of cameras, and a direct focussing screen in which you can see the picture full size, and know that it will be so on the negative has a lot to recommend it. Of course, it is slow, but I am not in a hurry if I want to get a good picture. I propose buying the best lens I can afford. A shutter will not be fitted, as I know nothing about them; I will use a lens cap. The camera will be made entirely in aluminium on a 3-in. lathe and 8-in. stroke hand-shaper. I do not consider that the making of a camera such as this calls for a great deal of precision work. Many I have seen appear to me to have more spit and polish than precision fitting embodied in them. It would be interesting to hear other readers' views on this subject. There must be many readers who have made their own camera and many more who would like to "Have a Go."

Mr. Russell's article is an excellent one and I am looking forward to seeing more of this subject in these pages.

Yours sincerely,

Colwyn Bay. ANDREW TODD.

A Sturdy Veteran

DEAR SIR,—I read with interest Mr. Mather's letter in THE MODEL ENGINEER issue of the 11th January, 1951, on the subject of old type Drummond $3\frac{1}{2}$-in. centre lathes.

Personally, I think there was more to be said for the old central leadscrew than against. There is no doubt that the ideal method moving the carriage, is to apply the force between its guides. The outside leadscrew tends to slew the comparatively narrow carriage round, thereby placing all the friction and hence the wear at the extreme ends of the carriage.

Whilst I agree that the outside leadscrew collects less swarf than the central one, also, without a doubt, its manufacturing cost is lower, I would put these as secondary considerations.

These remarks, of course, do not apply to the modern lathe with its wide bearing surface designed to look after the offset thrust of the leadscrew.

In 1912 the $3\frac{1}{2}$-in. Drummond was advertised complete with change wheels to cut all Whitworth pitches from $\frac{1}{16}$ in. to 1 in., also brass and gas threads. The minimum basic wheels to cover these threads are 20, 30, 35, 38, 45, 50, 55, 65, plus one wheel having twice the number of teeth of any one of these wheels.

As, however, the choice of wheels is also dictated by the possible mechanical arrangement on the studs, duplicates and multiples are introduced.

The following would, I think, have been the original wheels provided: 20, 20, 30, 30, 35, 38, 40, 45, 50, 55, 60, and 65; for metric threads, a 65-wheel was available at extra cost to standard equipment.

I have by me a George Adam's catalogue of 1912, that used to fill my heart with longing in those far off days—remember old times! In it beautifully illustrated, is the centre leadscrew $3\frac{1}{2}$-in. Drummond, complete with stand, treadle, and standard equipment offered at £13 10s. or as a bench lathe at £10 10s.

My own Drummond has the old round-belt drive and as a criterion, would say, that it managed all the machining on my 5-in. gauge locomotive "Liberty." This does not mean to say that I would not prefer the modern vee-belt

which is undoubtedly the ideal drive in every way, but it just shows that the round belt can handle all the power that the lathe in question was designed for.

Yours faithfully,

Maidstone. E. G. RIX.

Boycotting the Amateur

DEAR SIR,—With regard to your editorial comments on page 2 under the title of "Boycotting the Amateur," I am able to confirm that this subject is receiving considerable attention from professional watch and clock repairers. So much so that a competition was organised recently by the *Horological Journal*, asking contributors to "propose solutions to the problem of restricting supplies of repair material to legitimate members of the trade." It is interesting to note from the results that many of the competitors are in favour of giving amateurs a certain amount of support!

On the other hand, a branch of the British Horological Institute in the north of England has persuaded twelve material suppliers to sign an agreement that they will sell material only to *bona fide* members. Let us hope that this branch of the B.H.I. never discovers that some watch and clock material dealers advertise in THE MODEL ENGINEER.

Yours faithfully,

Belfast. W. G. MARTIN.

CLUB ANNOUNCEMENTS

Society of Model and Experimental Engineers

The society's annual general meeting was held in the Caxton Hall on January 20th, 1951. Among the items of business transacted was the election of a treasurer, three council members, and four chairmen of committees. Mr. D. H. Harris was re-elected treasurer of the society and Messrs. H. H. Fenn, J. L. Thorp, and C. Tidy were elected members of the council. Messrs. R. W. Gorrod, H. E. White, G. W. Wildy and A. C. Warren were elected chairmen of the workshop, track, stationary engine, and house committees, respectively.

The next meeting of the society will be held at the Caxton Hall on Saturday, February 24th, 1951, at 2.30 p.m., when Mr. Finch will give a talk on "Traction Engines."

All members and visitors are welcome, and prospective members may obtain particulars and forms of application to join the society from the Hon. Secretary, A. B. STORRAR, 67, Station Road, West Wickham, Kent.

Whitefield and District Model and Engineering Society

The above club held their annual general meeting on a recent Friday when the officers were re-elected *en bloc.*

On Friday, March 2nd, Mr. Stevenson will give a talk on the "Manufacture of Quartz Crystals."

Work has commenced on the club's 1-in. scale tank locomotive, to the designs of H. P. Jackson.

Hon. Secretary: A. STEVENSON, 2, Newlands Drive, Prestwich. PRE. 3286.

The Bedford Model Yacht and Power Boat Club

The main item on the agenda at the recent annual general meeting was the consideration of a proposition received from the Bedford Society of Model and Experimental Engineers that the two organisations should amalgamate. This question was discussed at the second annual general meeting last year when the matter was left in abeyance for 12 months. On a vote being taken it was unanimously decided to amalgamate fully with the engineering society, and a sub-committee formed to meet representatives of the society with a view to the whole matter being discussed and to arrange a general meeting of all members of both bodies. It is felt that all will benefit from this decision, particularly as some people are members of both organisations and pay two subscriptions.

Although the almagamation will not materially affect the club's summer programme, it may be necessary to revise some dates of events but the annual power regatta will be fixed as soon as possible.

Hon. Secretary: K. BROWNRIDGE, 18, Phillpotts Avenue, Bedford.

Ickenham and District Society of Model Engineers

The society had a return visit of Messrs. Trezise and Hodson, of the Westinghouse Signal Company. This time they gave us a very interesting insight into the modern aspects of power signalling, including one which is not yet in operation. This was followed by an account of a very interesting cable-operated railway in Brazil. Mr. Hodson was intimately connected with this particular line for many years, and was thus able to spice his talk with personal experience. The lantern slides which illustrated the two talks made the members realise the colossal amount of work involved.

The keen electricians mong the members were most interested in the methods adopted to test signalling circuits before they were passed for operation. They must truly be called an electrician's nightmare.

Plans are already under way for the annual exhibition and the neighbouring societies will be canvassed later. It is these annual events which prove the co-operation between all who have model engineering at heart, and it is surprising the number who have.

North Devon Society of Model Engineers

The annual general meeting of the society was held recently at the Northgate Hotel, Barnstaple.

Mr. J. E. P. Hutchinson after presenting his annual report on the various activities of the society, and thanking Mr. J. Gifford and Mr. H. Prince, who acted as exhibition secretary and exhibition treasurer, and all who helped in any way in making the exhibition such a grand success, said that he hoped that the members would be able to stage another exhibition this year, but this to be held in a different North Devon town, Bideford if possible. The $3\frac{1}{2}$-in. gauge track at Pottington Field had a successful year, but needed repair and asked for volunteers to come forward and help with this work. Several members and friends from other societies had visited the track during the past year, and he wished to welcome any such visitors in the future.

The hon. secretary will be glad to hear from any person living in the North Devon district who is interested in joining the society.

Hon. Secretary: J. E. P. Hutchinson, 8, Clinton Terrace, Barnstaple, North Devon.

Luton and District Society of Model Engineers

The above society held their fourth post-war annual dinner at the Griffin Inn, Chapel Street, Luton, recently when 36 members and friends had a very enjoyable reunion.

The society was pleased to welcome as its guest of honour, Mr. Edgar T. Westbury who, in his response to the chairman's address, expressed his pleasure in meeting so many old friends, and commented upon the number and high standard of the many "bits and pieces" on view.

One matter, which appears to be no nearer solution in spite of members' efforts, is the inability to obtain a satisfactory site for a permanent track, but efforts will continue in this direction with hope of success in the future.

The society meets monthly on the first Friday evening in each month at the Griffin Inn, and a welcome is extended to all who have a genuine interest in furthering the cause of good craftsmanship and model engineering.

A particular feature of the meetings is their informal nature, and no annual fee is required in respect of membership, but each member who attends a meeting contributes 1s. towards the cost of the room, the residue going to society funds.

Hon. Secretary: D. BOND, 31, Compton Avenue, Luton.